proposal

Waterfront Land Use Plan
CITY OF NEW YORK

Bechtel Corporation July 1969

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July 24, 1969

Patrick F. Crossman, Commissioner
City of New York
Economic Development Administration
Department of Ports and Terminals
Battery Maritime Building
New York, New York 10004

Dear Commissioner Crossman:

We are pleased to re-submit Bechtel's proposal for preparation of a waterfront land use plan for the City of New York. We greatly appreciate receiving the frank and thoughtful comments in your July 3 letter, and have re-evaluated your work statement to be sure that the following revised "Scope of Work" fully complies with both the written words and your desired intent of the study.

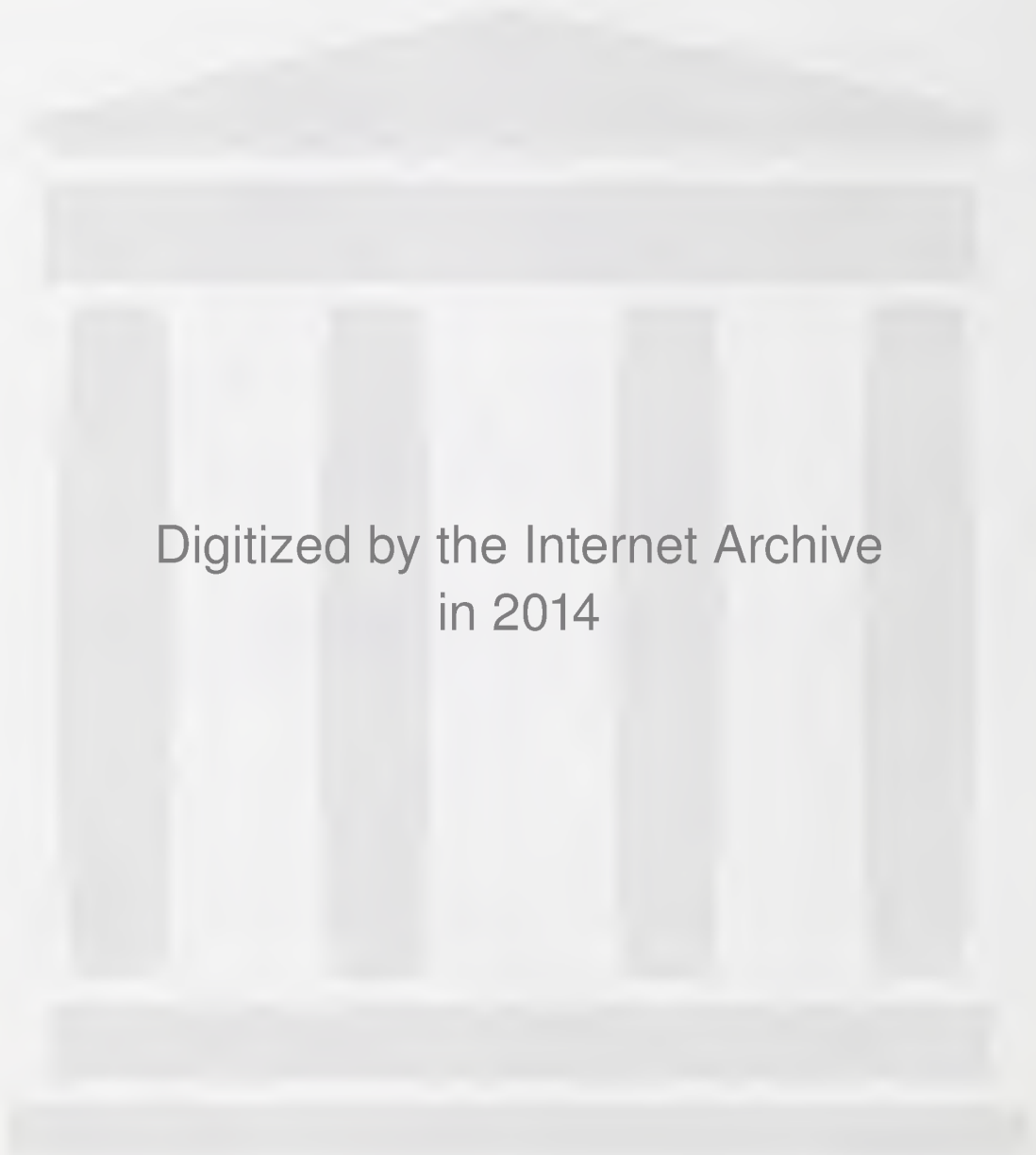
In this Brochure we will show how Bechtel's qualifications, capabilities and experience completely match your requirements for a construction firm to provide these comprehensive services.

New York Experience

We have recently been involved in four major planning and development projects on the City of New York waterfront. These include a study for a multi-user Marine Passenger Terminal in the Chelsea area (Client: U. S. Lines), a Public Containership Terminal at Howland Hook on Staten Island (Client: American Export Isbrandtsen), an Oil Tanker Terminal at Stapleton and the City of New York Hunts Point Food Center. Work on these projects has helped to keep us informed on some of the current requirements and problems in the New York waterfront area.

Waterfront Experience

Bechtel has performed Economic Feasibility Studies, Cost/Benefit Studies, Planning Studies, designed and built port and harbor facilities throughout the world. Typical examples of some of these projects including the Port of New Orleans, Miami, Amsterdam, Nova Scotia and others are shown in the section of this brochure titled "Experience".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Urban Planning

Bechtel's planning group has performed services on projects throughout the world ranging from regional economic development studies in Iran, Turkey and South America, to planning of complete new communities, industrial and commercial complexes and urban developments in the United States. Our services include economic base and market studies, physical planning, systems analysis and urban redevelopment. Our staff includes specialists in the ecology, sociology, political science, hydrology and utilities. Examples of some of our community planning projects are also shown in the experience section.

Transportation

Bechtel's transportation capabilities cover a wide range of services including Rapid Transit, Ocean Shipping Facilities, Airports, Intermodal Transportation Systems and Traffic Analysis. We are currently engaged in development of Rapid Transit Systems in San Francisco, Atlanta, Caracas, and St. Louis.

This project will be under the direct supervision of Mr. George Mavriks, Manager of Port and Terminal Facilities, who will be backed up by a full-time project team of skilled, experienced personnel. In New York City, engineering services will be performed under the auspices of our affiliate, Bechtel Associates, located at 485 Lexington Avenue, where a staff of over 450 engineers and technicians is maintained. We plan to staff the project with personnel shown in the organization chart included in the proposal. Resumes of key personnel are also included. We will continue to work on the same project team basis as was used in the Hunts Point Food Center Project. In addition, the specialized skills of all Bechtel Divisions will be made available as required to provide input and experience in a wide range of disciplines.

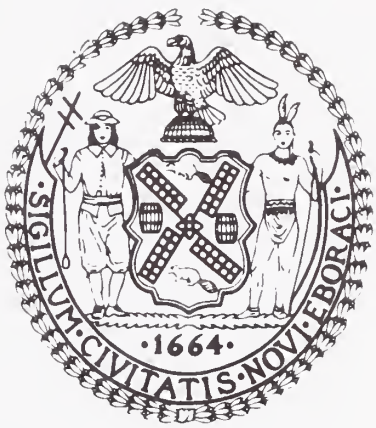
It is our intent to develop an investment policy and a long range plan, working closely with the Economic Development Administration and, under your direction, will make maximum use of pertinent previously developed material and studies to avoid duplication. We will use your guidance in coordinating our efforts with other city and regional public and private agencies who will be involved. We have enclosed a detailed outline of our scope of work and our approach to the project. We are also enclosing copies of several of the master plan studies referred to above as samples of previous work in this field and to illustrate the type and quality of report we plan to furnish to the City of New York. In addition we have enclosed a copy of a recent Technological Forecast of Marine Transportation Systems co-authored by the Systems Analysis Group Leader designated to work on your project. This study is currently submitted for publication in *Future's* magazine.

We propose to provide the services described for the fixed price amount of $192,000. If we are selected for this project, we will be pleased to discuss with you any additions or deletions or other methods of compensation which you may prefer. We anticipate seven months for completion of the study, plus about one month for printing of the final report after approval; a detailed schedule is enclosed.

Bechtel's comprehensive services, our specialized capabilities, and our experience in working in the New York area can be of great benefit to the City in the performance of this study. We would appreciate the opportunity to make a formal presentation, or to meet with you for further discussions. Thank you for your interest in Bechtel and I hope that we may have the opportunity of again working with the City of New York.

Sincerely yours,
BECHTEL CORPORATION

George L. Mavriks
Manager of Port and Terminal Facilities



proposal
Waterfront Land Use Plan
CITY OF NEW YORK

Bechtel Corporation **July 1969**

PREFACE

The character of present-day waterfront use has primarily been determined by the needs of another period. Within certain limits, alterations can and have been made. But, the changing patterns of social and economic life, population growth and recent technological improvements have tended to place most of the world's ports out of phase with the regions they serve and their environment.

Much of the waterfront blight today can be attributed to the disuse of facilities that have outlived their economic reasons for existence. Concurrently, intermodal transportation interties so vital to today's commerce have frequently been severed and must be re-established. This is particularly true of rail service and to a lesser degree the highway network serving the City of New York. The recreational use of waterfront land has been limited because of the pressure of commercial need. However, enormous strides in cargo handling efficiency provided by new technology will relieve this situation by greatly increasing productivity of waterfront land. Added to these factors is that the conveniences and economic benefits of intermodal transportation have compounded the attractiveness of water oriented sites to industry.

The realignment and rededication of waterfront areas has emerged as a prime responsibility for the City of New York and it is to this end that this effort will be dedicated.

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OBJECTIVES & SCOPE OF WORK

OBJECTIVE

The objective of this study is to develop an investment policy that will permit the City of New York to implement a program for development of waterfront land and associated capital facilities between the present time and 1985. All credible economic uses of waterfront land will be considered in establishing the recommended program of waterfront development. Optimum land use patterns consistent with applicable planning and development programs, for the 1970-1985 period, phased in five-year increments, will be determined on the basis of relative cost/benefit relationships.

The study will also seek a quantitative method to establish cost/benefit ratios applicable to non-economic uses so that the final land use plan will reflect an optimization of economic and non-economic uses. In order to achieve a proper balance between various uses, absolute cost/benefit ratios will be adjusted to account for the differing effects of various uses and the fact that maritime and certain industrial and transportation facilities do not have locational alternatives.

The study's objectives will include defining, assessing, evaluating, and forecasting the critical factors involving a waterfront land development program. This will result in assigned uses that benefit the whole community and ensure that the waterfront remains a viable part of the City.

SCOPE OF WORK

Successful execution of so comprehensive a project requires that the contractor who performs this study have a broad familiarity with the economic and industrial technologies involved. He also must be sensitive to the needs and problems of the City and experienced in dealing with them and with the applicable City agencies.

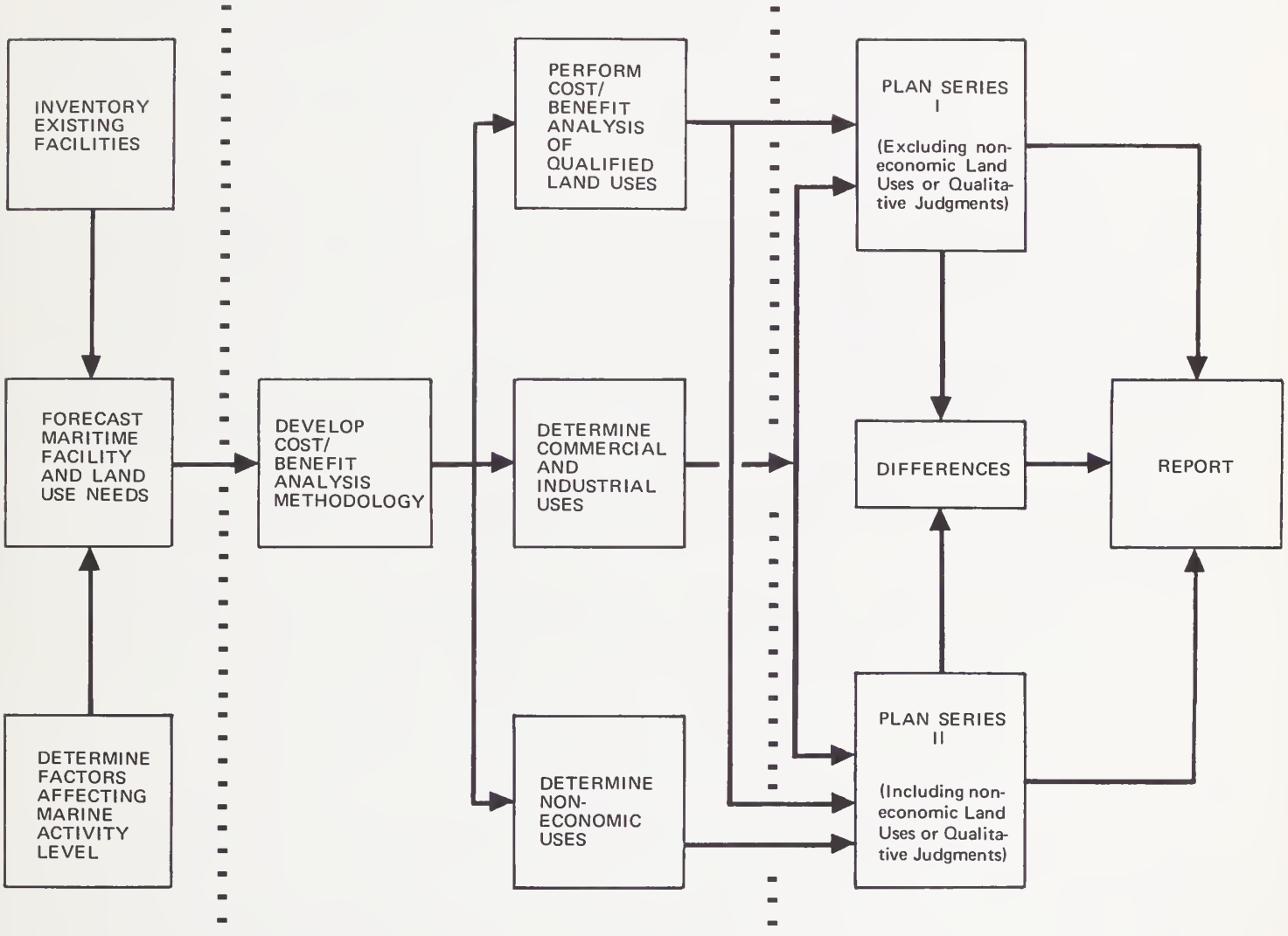
Bechtel recently completed four master plan projects for waterfront development in the City of New York within the area of this study. Their technological diversity included an integrated food distribution and processing center in the Bronx, a major containership terminal-industrial park development on Staten Island, a supertanker terminal at Stapleton, and a marine passenger terminal on Manhattan.

A successful solution to the development problems faced by the City requires the application of modern tools of forecasting and resourceful planning by a team of specialists experienced in performing waterfront land use studies. Careful integration of the findings of earlier studies and objectives of current plans into the long-term waterfront land use plan must be accomplished to avoid duplication of effort. Changes in the face of the City's waterfront provide an opportunity to coordinate highway reconstruction with new and more appropriate uses of the adjacent land and constitute an unparalleled opportunity for civic improvement.

The study will be performed in three phases. The first phase will include an inventory of waterfront characteristics, the identification and direction of technological trends and their impact on maritime commerce and waterfront land usage. The second phase will develop means for evaluating maritime and non-maritime investment alternatives and the third phase will include a series of land use plans for waterfront development.

The diagram on the following page depicts the general work plan established for the study and shows the interrelationship of the major tasks. A detailed project work plan is presented in the section entitled "WORK PLAN and SCHEDULE".

GENERAL WORK PLAN


INVENTORY EXISTING FACILITIES
FORECAST MARITIME FACILITY AND LAND USE NEEDS
DETERMINE FACTORS AFFECTING MARINE ACTIVITY LEVEL
DEVELOP COST/ BENEFIT ANALYSIS METHODOLOGY
PERFORM COST/ BENEFIT ANALYSIS OF QUALIFIED LAND USES
DETERMINE COMMERCIAL AND INDUSTRIAL USES
DETERMINE NON-ECONOMIC USES
PLAN SERIES I
(Excluding non-economic Land Uses or Qualitative Judgments)
DIFFERENCES
PLAN SERIES II
(Including non-economic Land Uses or Qualitative Judgments)
REPORT
PHASE I
PHASE II
PHASE III

PHASE I

The goal of the first phase is a projection of the demand for maritime facilities and waterfront land. Phase I will be devoted to collecting physical and economic data on port facilities, determining and quantifying factors which affect the level of maritime activities, forecasting future ship traffic and cargo handling requirements, and forecasting the demand for maritime land use during the period 1970—1985. From this base it will be possible to identify and evaluate maritime and non-maritime investment options in Phase II.

A. Characteristics of Existing Facilities

To provide a starting point for the study it will be necessary to conduct an inventory of maritime facilities. Data to be gathered will include physical features, types and quantities of cargo and ships accommodated, utilization ratios, revenue contributions to the city, operating characteristics, intermodal interface capabilities, commitments, book value and plans. This information, together with the forecasted need for maritime facilities will allow judgements to be made of the adequacy of existing facilities to meet future requirements. The data to be collected is summarized as Item I in Table A, Data Bank Contents. A majority of this data has already been compiled and tabulated by local agencies, so that very little additional field work is contemplated for this phase of the study.

B. Method of Forecasting the Level of Maritime Activity

The major cargo classifications to be considered will be:

- Break-bulk general cargo
- Containerized general cargo
- Building materials, coal, and other dry bulk
- Liquid bulk

Ship traffic will be classified into:

- Passenger liners
- Freighters
- Containerships
- Barge carrier ships
- Special dry bulk carriers
- Tankers
- Barges
- Excursion vessels

DATA BANK CONTENTS

1. CHARACTERISTICS, PRESENT AND PLANNED USE OF EXISTING FACILITIES

   a. Inventory of dimensions, features, age, condition and owner and/or user.

   b. Types and quantities of cargo handled.

   c. Types of vessels accommodated and berth occupancy rate.

   d. Revenue contribution to city by taxes, lease, and service charges where such data is available.

   e. Utilization ratios: physical use and revenue contribution as percent of theoretical maximum.

   f. Nature of use as public or private terminal, corporate characteristics of user (parent, subsidiary, etc.), nature of lease agreements when applicable, operating practices.

   g. Intermodal interface capabilities for road and rail transfers.

   h. Current non-maritime use commitments.

   i. Book value, debt service and operating costs where available (for New York City only).

   j. Plans for expansion, modernization, or improvement and estimated effect on the level of maritime activity.

2. COMMODITY TYPES AND QUANTITIES

   a. Historical growth rate for commodity groups employed in maritime activity level forecast by selected trade areas. Trade areas will include Europe, Far East, South America, Central America, Africa, and others.

   b. Influence factors anticipating possibility of change in historical growth rates during the period of 1970-1985, resulting from sociological and economic changes in the U.S. or other trade areas of interest. These will typically be equations as a function of time.

   c. Distribution by handling category of traffic with selected trade areas.

   d. Distribution by proportion of total Port of New York traffic handled by City of New York.

3. ENVIRONMENTAL PARAMETERS

   a. Influence factors to establish consistency between forecasts of Maritime activity in Port of New York, New York City, and national trends. These factors will include:

      - Variations in gross U.S. foreign trade level
      - Gross National Product and Industrial Production Index trend and changes
      - U.S. total and regional population growth trend and changes
      - Federal laws or tariffs which affect Maritime trade
      - Government (including DOD) transportation requirement trends
      - International political realignments

4. SHIP TECHNOLOGY

   a. Trends of Port of New York traffic by ship types.

   b. Trend and forecast of world cargo fleet of conventional ship types by following characteristics:

      - Length
      - Beam
      - Draft
      - Deadweight tonnage

   c. Maximum, median and standard deviation values of above parameters for each ship class.

   d. Trends for use of unconventional ship types:

      - Sub-surface carriers
      - Hydrofoils and hovercraft
      - Nuclear powered craft

   e. Influence factors relating changes in ship technology to nature and volume of trade.

5. CARGO HANDLING TECHNOLOGY

   a. Trends in ship-shore intermodal transfer capabilities for various ship types, such as:

      - Change from ship cranes to shore cranes for handling containers, followed by change to cranes which can handle more than one container at once
      - Change in conventional ship's gear from 5-ton gear at all hatches to 20-ton gear at all hatches
      - Changes to barge size cargo units in LASH ships

   b. Trends in intermodal transfer capabilities for land transport modes.

   c. Trends of competing or complimentary transportation modes:

      - Land-bridge or unit trains
      - Air freighters
      - Trans-ocean barges

   d. Influence factors relating changes in cargo handling technology to nature and volume of trade.

6. WATERFRONT LABOR

   a. Trends in following characteristics of waterfront labor force by major commodity groups.

      - Size of waterfront labor force by geographic regions
      - Size and composition of work gangs
      - Source of labor between ILA, carrier, and shipper consignee
      - Range of productivity expressed as man-hour/ton handled
      - Employment utilization expressed as man-hours/year by commodity groups and by port geographical regions

   b. Trends in labor relations practices which tend to encourage or discourage major commodity groups from moving through the port.

The method for making the forecasts has been developed in a recent study performed for a major port. The individual steps are summarized below:

1. Develop trade profile and historical trend. For each major cargo group and foreign or domestic trade area (trade element) define the current trade volume and determine growth rates, averaged over at least ten years, for imports and exports. Each element will contain information such as the tonnage of cargo imported from Europe in 1968 and the average annual rate of growth from 1958 to 1968.

2. Determine economic influence factors and modify growth rates as required. The growth rates determined above will be examined to determine whether they will continue, increase or decrease. For example, trade with the Far East has increased dramatically in the past 10 years. However, growth rates are not expected to continue at their current high levels due to developing trade imbalances between the U.S. and Japan.

3. Define environmental parameters and determine their influence on trade. National and regional economic and trade indicators will be examined to provide general guidelines for forecasted growth rates. Parameters examined will include U.S. and regional (Atlantic coast) foreign and domestic trade levels, gross national product, industrial production index, population growth, trends in DOD shipments, and international political realignments. The potential, long range effects of the Kennedy Round, a vigorous European Common Market and LAFTA on trade in the Port will be evaluated based on reasonable forecasts as to their effectiveness. Consideration will be given to potential increases in U.S. Trade with these foreign areas, but also to decreases due to competition. The latter trend is already discernible in parts of South America. Legislative changes which might affect the flow of trade will be analyzed. Congressional plans for modification of the Jones Act affecting intercoastal and intracoastal trade and/or Operating Differential Subsidy will be investigated.

4. Incorporate technological factors. Developments in ship and cargo handling technology will increase or decrease trade in the port. Consideration will be given to the effect on total New York trade of unconventional ships (e.g. sub-surface, hovercraft), LASH barge carriers, trans-ocean barges, competition from air freighters or the land-bridge. For example, in a previous study for a major port it was estimated that hovercraft would increase general cargo trade by ½% per year, while barge carriers would increase that trade by as much as 7% per year. On the other hand it was estimated that competition from air freighters would, within 30 years, capture as much as 15% of container cargo.

5. Develop and incorporate into the forecast the relationship between labor practices and total trade. This will be specified to estimate the effect of labor costs and productivity on particular cargo groups. For example, the trends of labor dispute settlements between the ILA and Teamsters on containerization will be analyzed with regard to their effects on containerized cargo through the Port.

6. Incorporate the above factors to develop projections for each major cargo category and each major trade area. Figure 1 illustrates, graphically, how any particular trade element might look and how it would evolve from an essentially historical forecast to one which incorporates the factors discussed above. The trade elements will be summed to develop projections of total trade. With the cargo forecast in hand, the resulting ship traffic can be determined directly. The amount of cargo carried by each type of ship will be established by briefly surveying the current and projected composition of the world merchant fleet and establishing average ship sizes in each class. Then, for example, the projection of container cargo plus the definition of an average containership will allow the determination of containership traffic in the port.

Figure 2 has been included to summarize the expected relative relationships between the factors discussed above and the level of maritime activity in the port.

C. Data Bank and Forecast Computational Procedure

It is anticipated that a simple computer program will be written to accomplish the forecasts discussed previously. Computerizing the forecast will allow it to be easily updated at any time in the future as more information becomes available.

The basic data for the forecast will be stored on IBM punch cards for use in the computational subroutines. Table A summarizes the contents of this data bank. Items 2 through 6 apply specifically to the forecast. Item 1 will be used later for evaluating the ability of existing facilities to meet future requirements – both type and quantity.

D. Maritime Facilities Requirements Forecast

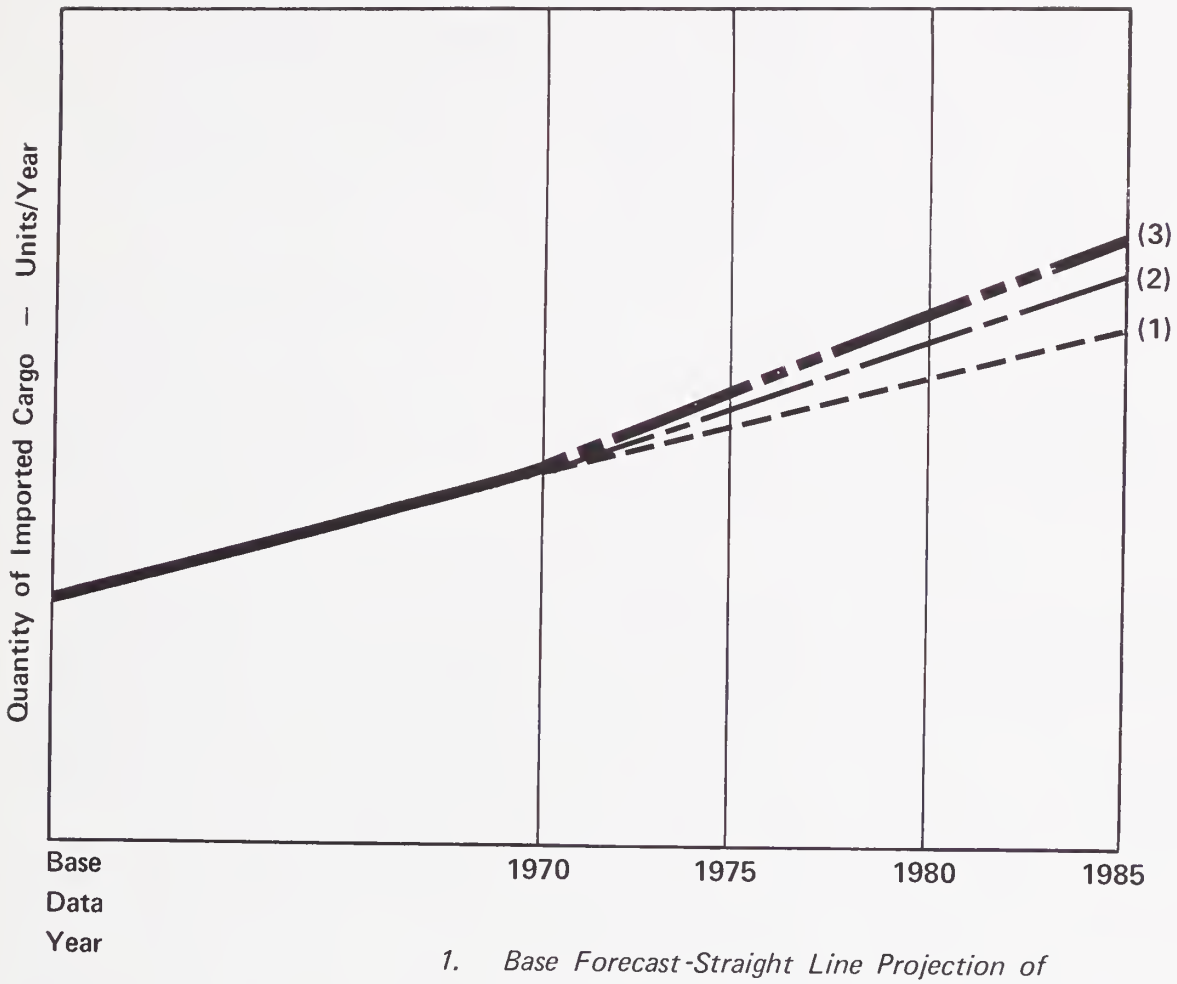
The results of the cargo and ship traffic projections will be used to establish the size, type, and number of maritime facilities required during the forecast period based on estimated throughput capacities for each type of facility.

The resulting forecast of the demand for the type and quantity of future maritime facilities will be compared to the existing facilities and plans. Surplus demand will be designated for incorporation into the waterfront land use plan. Existing facilities and maritime land uses will be designated either for retention in service in their present configuration, for redevelopment to new maritime uses, or for redevelopment to new non-maritime uses.

The foregoing forecasts will establish the future land requirements and type of facilities needed to conduct this port's projected maritime business. Having met the maritime needs, the balance of the waterfront land can then be critically analyzed as to the best possible combination of uses including maritime related, industrial, commercial, residential, transportation, government and recreational.

Figure 1

TYPICAL FORECAST OF LEVEL OF MARITIME ACTIVITY



1. *Base Forecast-Straight Line Projection of Historical Data*

2. *Modified Forecast – Base Forecast Adjusted by Sociological and Economic Influence Factors*

3. *Final Forecast – Modified Forecast Adjusted by Summation of Technological Labor and Environmental Influence Factors*

(All Historical Data and Influence Factors will be entered in Data Bank)

COMPARISON OF INFLUENCES ON FORECASTED MARITIME ACTIVITY

FIGURE 2

FACTORS INFLUENCING FORECAST LEVEL / FORECAST PARAMETER	TECHNOLOGICAL	Ship Technology	Cargo Handling Technology (Ship-Shore)	Cargo Handling Technology (Other Modes)	SOCIOLOGICAL	Labor Force Productivity	ENVIRONMENTAL	U.S. Foreign Trade Levels	Competition From Other Ports	Changes in Commodity Sources/Consumption	Legislative and Tariff Changes	U.S. Economic Indicators	International Political Realignment	Government Transportation Requirements
TRADE PATTERN – IMPORT OR EXPORT														
U.S,A. – FOREIGN		M	M	L		S		-	-	M	M	M	M	M
PORT OF NEW YORK – FOREIGN		M	M	L		M		L	L	L	M	M	M	M
PORT OF NEW YORK – DOMESTIC		M	M	L		M		L	L	L	S	S	S	S
CITY OF NEW YORK – FOREIGN		M	M	L		M		L	L	L	M	M	M	M
CITY OF NEW YORK – DOMESTIC		M	M	L		M		L	L	L	S	S	S	S
ORIGIN/DESTINATION DATA – PORT OF N.Y.:														
– TRANSSHIP		L	L	L		L		L	L	L	M	M	M	M
– TRANSSHIP WITH VALUE ADDED		L	L	M		M		M	M	M	M	M	M	M
– LOCAL CONSUMED OR ORIGINATED		S	M	S		S		S	S	S	S	S	S	S
ORIGIN/DESTINATION DATA – CITY OF N.Y.														
– TRANSSHIP		L	M	L		L		L	L	L	M	M	M	M
– TRANSSHIP WITH VALUE ADDED		L	M	M		M		M	M	M	M	M	M	M
– LOCAL CONSUMED OR ORIGINATED		S	M	S		S		S	S	S	S	S	S	S
OCEAN–GOING VESSELS														
PASSENGER LINERS		L	S	S		S		S	S	S	S	S	S	S
BREAK-BULK FREIGHTERS		L	L	S		L		S	S	S	S	S	S	M
CONTAINERSHIPS		L	M	L		L		S	S	S	S	S	S	M
COMBINATION FREIGHTERS/CONTAINERSHIPS		L	L	M		L		S	S	S	S	S	S	M
PALLET SHIPS		L	M	L		L		S	S	S	S	S	S	S
OTHER UNIT-LOAD SHIPS		L	L	L		L		S	S	S	S	S	S	S
ROLL-ON/ROLL-OFF SHIPS		L	L	L		S		S	S	S	S	S	S	M
SPECIAL DRY-BULK SHIPS		L	L	M		S		S	S	S	S	S	S	S
COMBINATION DRY/LIQUID BULKERS		L	L	M		S		S	S	S	S	S	S	S
TANKERS		L	S	S		S		S	S	S	S	S	S	M
NON–OCEAN–GOING VESSELS														
EXCURSION VESSELS		S	S	S		S		S	S	S	S	S	S	-
GENERAL CARGO		S	S	S		S		S	S	S	S	S	S	-
RAIL CAR CARRIERS		S	S	M		S		S	S	S	S	S	S	-
DRY BULK		S	S	S		S		S	S	S	S	S	S	-
BULK LIQUID		S	S	S		S		S	S	S	S	S	S	-

L = LARGE M = MEDIUM S = SMALL

PHASE II

This phase of the study will be performed in five successive and interrelated steps. The first will project the demand for non-maritime land uses to complement the demand for maritime land requirements projected in Phase I. The second will select the number, size, and location of individual land increments to be considered by the study and identify the areas of greatest interest. The third will analyze the factors which determine the physical suitability of any one of the land increments under consideration to any of the possible land uses. The fourth will develop a method to compare physically qualified land use alternatives on the basis of their costs, benefits, and cost benefit ratios. The fifth will screen physically qualified uses for specific areas by comparison of cost-benefit ratios to establish economically qualified uses.

A. Forecast of Non-Maritime Land Requirements

In developing the non-maritime land use requirements forecast, maximum use will be made of existing economic projections for the Greater New York area. Limited pre-investment engineering feasibility studies will be conducted if needed to determine physical limitations of a potential waterfront land use. The nature of those studies could typically include rough order-of-magnitude estimates on land acquisition, demolition and removal, site adaptation, or utility relocation. Existing studies, data, and forecasts of the Greater New York region's demography and industrial and commercial activity will be collected and used to analyze the trend of industrial and commercial development during the three phases of the study period. New data will be developed only to a limited extent. Changes in business-industry patterns and technology will be considered as possible modifiers to the trends forecasted. The results of this analysis will be applied to land develop usage criteria, applicable to a particular activity, and to produce an estimate of gross land use requirements through the duration of the study period.

Non-economic land uses will include government facilities, transportation, recreation, tourism, and public housing. Government facilities include Federal and State, in addition to City facilities. Recreation uses are those facilities provided primarily for the enjoyment of City residents as differentiated from tourism which will also attract visitors from outside the City. Requirements for these uses will be determined in conjunction with the appropriate City departments and will be based on existing projections and data to the maximum degree feasible.

B. Number, Size, and Location of Land Increments, and Areas of Greatest Interest

Land areas will be divided into a suitable number of increments with common physical and socio-economic characteristics which can be considered as single planning units for purposes of assessing their physical suitability for alternate land uses. The size of these increments will vary in accordance with their locations and whether or not they are included in one of the areas of particular interest described below.

The study area includes all property in New York City that abuts any major waterway. Large portions of waterfront land have been previously committed to well justified long term uses which permit their exclusion from further use determination by the study. Typical areas are included among every land use category, and together they allow a substantial reduction in the geographic magnitude of the land use study while permitting the study effort to be concentrated on areas of the greatest interest. Existing commitments for long term uses such as the World Trade Center, Battery City, South Street Museum, United Nations Plaza, and the Marine Passenger Terminal in Manhattan; the Stapleton and Howland Hook Containership Terminals in Richmond, Brooklyn Navy Yard and the College Point Industrial Park in Brooklyn; and the Hunts Point Food Center in the Bronx are examples of areas whose compatibility must be considered as imposing constraints on adjoining land uses while being excluded from determination by the present study. Exclusion of the preceding areas leads to identification of the following eight major study areas:

- North River (Manhattan West Side south of 72nd Street)
- East River (Manhattan East Side)
- Staten Island-North
- Staten Island-East
- West Brooklyn
- West Queens
- South Bronx
- West Staten Island

Accordingly, these areas will receive more contentrated attention by the study. The following map shows the study areas of major interest as well as the location of the projects discussed above and of major airports and recreation areas. Also shown are the location of several projects for which Bechtel Corporation has recently completed Master Plan Studies.

C. Factors of Physical Suitability

The physical suitability of a given land area will be established by grading its compliance with selected evaluation criteria of access, space, compatibility, and cost. Six general land use types will be considered in addition to maritime uses. They are:

- Industrial
- Commercial
- Residential
- Recreational
- Government
- Transportation

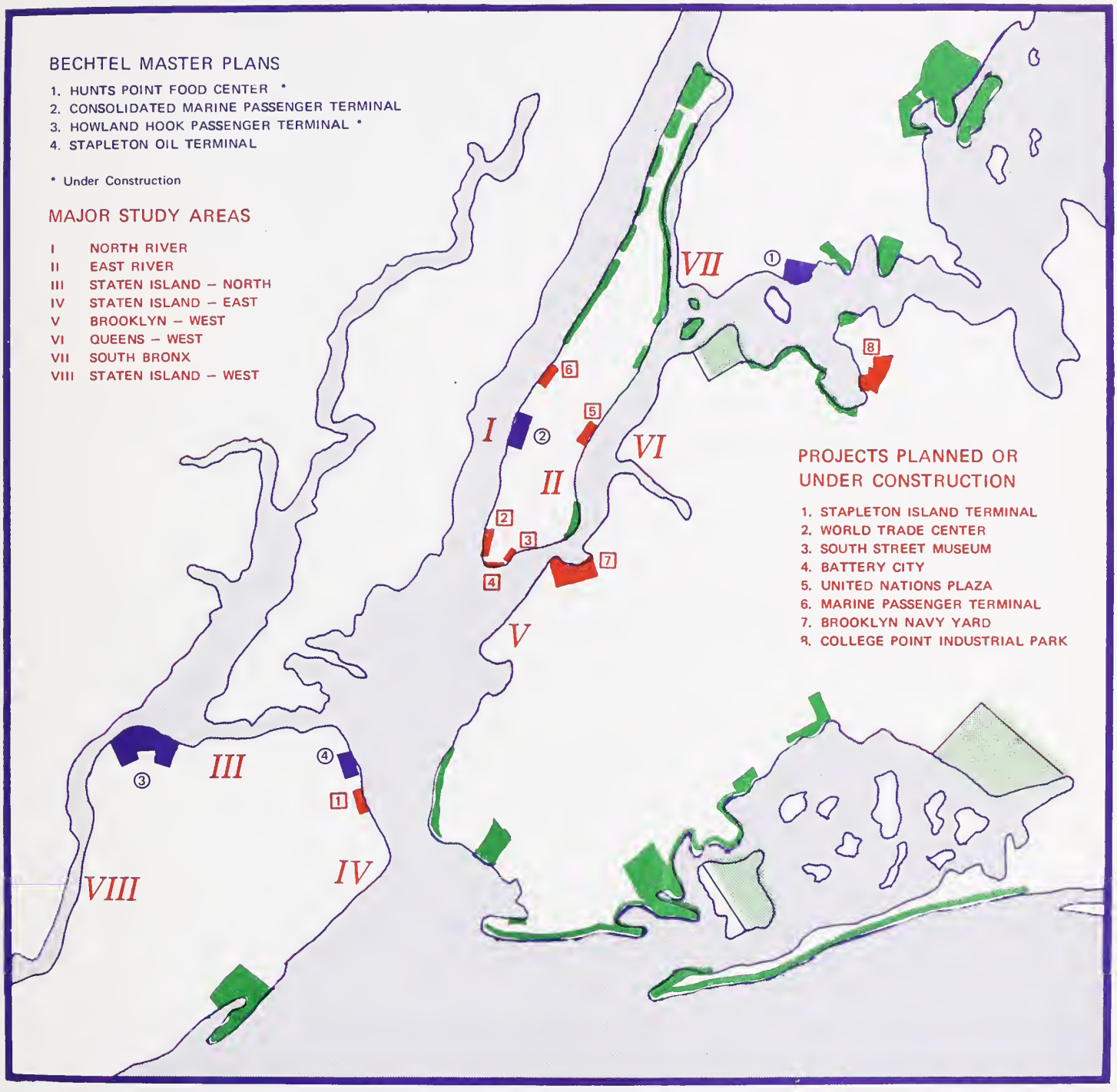

BECHTEL MASTER PLANS
1. HUNTS POINT FOOD CENTER *
2. CONSOLIDATED MARINE PASSENGER TERMINAL
3. HOWLAND HOOK PASSENGER TERMINAL *
4. STAPLETON OIL TERMINAL
* Under Construction
MAJOR STUDY AREAS
I NORTH RIVER
II EAST RIVER
III STATEN ISLAND – NORTH
IV STATEN ISLAND – EAST
V BROOKLYN – WEST
VI QUEENS – WEST
VII SOUTH BRONX
VIII STATEN ISLAND – WEST
PROJECTS PLANNED OR UNDER CONSTRUCTION
1. STAPLETON ISLAND TERMINAL
2. WORLD TRADE CENTER
3. SOUTH STREET MUSEUM
4. BATTERY CITY
5. UNITED NATIONS PLAZA
6. MARINE PASSENGER TERMINAL
7. BROOKLYN NAVY YARD
8. COLLEGE POINT INDUSTRIAL PARK
I
II
III
IV
V
VI
VII
VIII
BECHTEL MASTER PLANS
RECREATIONAL AREAS
AIRPORTS
PROJECTS PLANNED OR UNDER CONSTRUCTION

Table B, following, presents typical criteria which would be used for such an evaluation. Weighting factors which consider the comparative importance of different criteria to each individual land use are also shown. For any given land area under consideration, each use will be assigned a grading number ranging from zero to the specified maximum based upon the degree of compliance of that land use with that criterion at that particular location. Summation of the values establishes a comparative measure of the physical suitability of each location for a particular purpose. Under this system it is possible but not likely for a score of 100 points to be achieved by a candidate land use type which is particularly well suited to a certain area.

This assessment of physical suitability by qualitative judgement is in accordance with established principles of site selection practice. Other considerations in evaluation of the physical suitability of planning areas for maritime uses will include existing locational tendencies for traffic and port facilities within the port area, such as:

- Petroleum processing, bulk terminals, and chemical plants tend to be located in the Southwest portion

- Cement, sugar, lumber, gypsum rock, and other bulk products which are handled in lesser volume tend to be located in the East River Terminals

- General cargo terminals tend to be located at Manhattan, Brooklyn, and Richmond.

The conditions that resulted in the concentration of these activities in certain areas may no longer be valid, and the possibility of relocating certain of these activities must be weighed. Other factors which relate to the judging of prospective maritime development include the following:

- Although break-bulk and containerized general cargo require the most labor and receive the greatest public attention, bulk cargoes — principally petroleum, coal, and building materials — account for some 80 percent of total tonnage handled through the Port

- The tendency for certain types of waterfront activities to act as catalysts in attracting other related developments. (The integration of an industrial park containing import-export manufacturing industries into a major intermodal terminal typifies this catalytic effect. The Bush Terminal area of Brooklyn is an example of a particularly attractive site for this sort of development).

There are also a number of important factors affecting the selection of locations for industrial and commercial activities which may be considered qualitatively. These include:

- Developments which require waterfront property as well as those which have a high differential yield of benefits when assigned priorities to insure that the limited waterfront space available will be assigned to uses with the greatest return on investment.

Table B

FACTORS FOR DETERMINING SUITABILITY
OF LAND INCREMENTS FOR VARIOUS ALTERNATIVE USES

For any given land increment value of any factor can range from 0 to maximum shown according to how well the land increment complies with the particular criterion		LAND USE ALTERNATIVES						
EVALUATION CRITERIA		MARITIME	INDUSTRIAL	COMMERCIAL	RESIDENTIAL	RECREATIONAL	GOVERNMENT	TRANSPORTATION
ACCESS:	Markets, Customers, or Users	2	9	9	11	12	8	10
	Materials	0	9	6	0	0	0	0
	Labor	9	9	5	0	0	10	2
	Government Services	3	2	1	4	2	5	1
	Private Services	1	2	4	5	1	1	1
	Utilities	3	3	4	3	1	1	3
	Road	6	5	6	5	0	3	7
	Rail	6	6	4	1	0	1	7
	Water over 12 feet deep	8	0	0	0	0	0	0
	Airport	1	2	4	3	0	1	4
SPACE:	Initial	6	6	1	1	8	1	4
	Ultimate	4	3	1	1	0	1	4
RELATIONSHIPS:	Existing Land Use (Inland)	7	6	8	10	10	10	8
	Esisting Land Use (Adjacent)	7	6	8	10	10	10	8
	Planned Land Use (Inland)	10	9	12	12	16	13	12
	Planned Land Use (Adjacent)	11	9	12	12	16	13	11
COMPATIBILITY:	Easements	4	3	4	5	5	5	4
	Ecology	2	3	1	5	5	5	4
Lowest Development Cost For This Use		10	8	10	12	14	12	10
MAXIMUM FACTOR		100	100	100	100	100	100	100

- Particular effort must be devoted to establishing an environment, compatible with adjacent land uses, which is attractive to industries with a high employment per unit of product in areas which have a surplus of suitable labor.

- There is a need for providing an attractive environment for manufacturing industries which have a characteristically high value added per unit of product, and which produce high value, low volume products as opposed to those which process large volumes of low value raw materials. Although the State of New York leads other States in gross value added by manufacture, the growth of value added for New York and other Eastern centers has only been approximately 60 percent since 1947 compared with much higher rates on the West Coast.

- Evaluation of commercial and industrial waterfront sites will reflect their proximities and relationships to labor sources, markets, raw materials, transportation, and utility services as well as relation to other land uses.

- There is a need to select industrial and commercial uses which would also relieve long-standing problems of traffic circulation of both people and goods which are located away from the waterfront. The garment industry, for example, is concentrated into a few blocks in midtown Manhattan where it operates under chaotic traffic conditions. It might well be considered as a prospect for relocation to a separate industrial center planned for efficient movement of both people and goods. It is recognized that the conditions which tended to attract this industry to its present location would have to be provided at a new location.

- Industrial development candidates will include manufacturing, process, and distribution. The selection of manufacturing sites will be confined to locations remote from commercial and residential areas to avoid conflicts in land use. Medium and light manufacturing will be combined where possible to provide efficient vertical integration. Process industries will be judged with respect to raw material import requirements and pollution control requirements. Distribution industries will be assigned locations with the best orientation to intermodal transportation interfaces.

- Commercial applications as required to service both residential and industrial areas could include wholesale and retail merchandising; office spaces; and food, medical, personnel, and professional services.

- The opportunity to live adjacent to water is considered attractive by many citizens. Use of waterfront land for high density housing, particularly in higher-income districts, can often provide economic benefits competitive with industrial or commercial uses. The study will assume these types of residential developments to be economic land uses.

D. Cost/Benefit Analysis of Physically Qualified Land Use Alternatives

The analysis method which will be developed will concentrate upon expressing costs and benefits only as they relate to the City of New York; so that selection of waterfront land uses among competing candidates can be made with full awareness of the comparative economic impact on the city. For purposes of analysis, the study will treat all land uses that generate revenues which exceed or nearly equal their capital and operating costs as economic land uses. Land uses which yield no revenues, or only small revenues, in proportion to their capital and operating costs will be considered as non-economic land uses. Costs and benefits associated with economic land uses can be determined and forecast with reasonable precision. While the costs associated with non-economic land uses can be satisfactorily determined, techniques for quantification of benefits are not as well established. Nevertheless, recent work by Philip H. Friendly, et al, of Resource Management Corporation reported in "Benefit-Cost Applications in Urban Renewal. A Feasibility Study" indicates a reasonable method for quantification of benefits to the sponsoring city of such non-economic land uses. That method, which depends on certain qualified judgements, will be used to the extent feasible in quantifying benefits of non-economic land uses.

The evaluation method will be capable of equally pertinent application to both privately and public owned properties and projects. There is no land use, not even lack of use, which does not incur some cost to the city government. There are also very few, if any, land uses which do not return some measure of quantifiable benefits to the city. Table C, following, presents the nature and comparative magnitude of costs and benefits to the city which are associated with the various alternative of waterfront land uses.

There are also certain variations in the comparative magnitudes of costs and benefits to the city which are functions of the ownership/operator relationship associated with properties of various types. The comparative magnitude of such variations for the three ownership/operator alternatives is shown in Table D.

The development of costs and benefits will be time phased to reflect levels anticipated for the years 1970 (base year), 1975, 1980, and 1985. Cost and benefit values will be developed to coordinate with the units employed for the various land use parameters considered by the study.

E. Screening Analysis to Establish Economically Qualified Candidate Land Uses

The analysis will start with a preliminary screening, using the physical suitability factors described previously, which will evaluate the summations of the relative merits of each of the seven land use categories for all of the land area increments included in the study. The larger areas identified earlier as being of major interest have been divided into a suitable number of increments to establish individual planning areas of feasible size. The resulting summation will be inspected and irrational uses for each planning area eliminated from further consideration.

TABLE C

COMPARATIVE MAGNITUDES OF COSTS AND BENEFITS
TO CITY OF VARIOUS LAND USES

	LAND USE ALTERNATIVES						
	MARITIME	INDUSTRIAL	COMMERCIAL	RESIDENTIAL	RECREATION	TRANSPORATION	GOVERNMENT
COSTS TO CITY							
POLICE PROTECTION	M	M	L	L	S	S	S
FIRE PROTECTION	L	L	L	M	M	S	S
ADDITIONAL PUBLIC WORKS (STREETS, ETC.)	S	M	M	L	M	L	M
INVESTMENT OF CITY CONSTRUCTED FACILITIES	L	L	-	L	L	L	M
SUBSIDY TO LOW COST RENTALS	-	-	-	L	-	-	-
SANITATION	M	L	M	L	S	S	S
BENEFITS TO CITY							
OPERATING REVENUES (SERVICE FEES)	L	-	-	-	S	S	-
RENTAL OR LEASE FEES	L	L	M	M	S	S	M
EMPLOYMENT GENERATED	M	L	M	-	-	-	S
REDUCTION IN WELFARE COSTS	S	L	M	L	L	S	S
REDUCTION IN POLICE, FIRE, OTHER PUBLIC ADMINISTRATION COSTS	S	S	S	S	M	-	-
IMPROVED SOCIAL CLIMATE	S	S	S	L	L	M	S
SAVING OF TRANSPORATION COSTS	L	-	-	-	-	L	-
PROPERTY TAXES	L	L	L	L	-	S	-
CORP. INCOME TAXES	M	L	M	S	-	-	-
PERSONAL INCOME TAXES	L	L	L	-	-	-	-
PAYMENTS IN LIEU OF TAXES (ON LEASE PROPERTY)	L	L	M	M	-	-	L
SALES TAXES	-	-	L	-	-	-	-

L = LARGE M = MODERATE S = SMALL

TABLE D

COST/BENEFIT
APPLICATION AND DISTRIBUTION
FOR OWNERSHIP/OPERATOR
ALTERNATIVES

	OWNERSHIP/OPERATOR ALTERNATIVES		
	CITY OWNED AND OPERATED	CITY OWNED PRIVATELY OPERATED	PRIVATELY OWNED AND OPERATED
COSTS			
TO CITY	ALL	-	-
TO PRIVATE OPERATOR	SOME	MOST	-
TO PRIVATE OWNER	SLIGHT	-	ALMOST ALL
BENEFITS			
TO CITY	ALL	SOME	SOME
TO PRIVATE OPERATOR	SOME	MOST	-
TO PRIVATE OWNER	SOME	-	MOST

The second screening will consider the physically qualified land uses for each land increment or planning unit, examine the feasible ownership/operating alternatives, if any, and compare the costs, benefits, and cost-benefit ratios. It will also tabulate the employment generated by each rational combination of land use and ownership/operating alternative.

The result will be a ranking by comparative cost-benefit ratios of the economic qualifications of the economically feasible alternative land uses at each of the incremental areas under consideration. The analysis can also be summed up to include totals of the land areas within incremental ranges of cost-benefit ratios regardless of use, and total areas of each use category within selected increments of cost-benefit ratio.

At the conclusion of Phase II the quantified land use requirements which have been generated will be tabulated by type and time span during the study period. The physically and economically qualified uses will be compared by types and ranked by their prospective returns on investment with the aid of the cost/benefit analysis method developed in this phase. This will permit a comparison of the attractiveness of various maritime requirements with that of industrial and commercial uses, and of those non-economic uses found to be quantifiable. The resulting qualified land use types and quantified requirements are then ready to be implemented into integrated land use plans.

A general purpose method for simulation of such logistics problem elements is available for use at Bechtel. TRANSIM is an example of a simple, flexible, inexpensive, and general-purpose computer simulator adaptable without change to the needs of different transportation problems. It can be used for the analysis of exceedingly complex problems comprising mixtures of modes, facilities, equipment, methods, policies, and procedures; yet it can accept its data inputs in everyday language, using readily available data sources.

TRANSIM is generally suitable for system problems that are concerned with a number of operations, activities, and functions, with complex system interrelationships, for which suitable mathematical analysis techniques are not available. We anticipate that a program such as TRANSIM could be applied to problem situations within the Phase II analysis activity.

PHASE III

This phase of the study will produce two series of land use plans for development of the New York City waterfront. The first series of plans will be based on economic land uses which have been physically and economically qualified in the preceding phases. These will include all maritime, industrial, commercial and residential uses which have been quantified and any new recreational, transportation or government uses which are economic rather than non-economic in nature. The second series of plans will include the preceding economic land uses and also non-economic land uses in the residential, recreational, transportation and government categories.

A. Plan Formulation Method

Similar methods will be used to generate each series. Each plan will rely on three sets of input data:

- Total land demands within each use category for each time phase in the study period. Demand will be expressed in convenient units such as acres or linear miles of waterfront for the years 1975, 1980 and 1985.

- Input data for individual land increments will include increments will include increment identifier and size; costs, benefits, cost-benefit ratio, and increase in employment for each qualified land use. It is anticipated that most land increments will have only one or two physically and economically competing uses although some are anticipated to have three or even four. The cost-benefit ratios as structured in Phase II will permit consideration of both public and private investment alternatives and the comparative contribution of each to costs and benefits.

- A set of one or more constraints based on planning concepts which will influence the selection and allocation of uses among the available possibilities.

B. Planning Concepts

Several planning concepts will be considered in establishing the constraints imposed on development of the various plans. The following are typical of such concepts:

- A plan which first fills all quantified maritime requirements regardless of cost-benefit value and then proceeded to fill other requirements by comparative cost-benefit ratios.

- A plan which maximizes increases in employment at the expense of other planning criteria.

- A plan which maximizes the overall cost-benefit ratio while still meeting all quantified land requirements.

- A plan which maximizes overall cost-benefit ratio at the possible expense of not meeting quantity requirements for all land uses.

- A plan which maximizes benefits to the city regardless of costs.

- A plan based primarily on qualitative or intuitive judgements.

- A plan which is based on idealizing social needs at the expense of economic considerations.

C. Plan Series One — Economic Land Uses

Possible areas and uses will be combined with quantified demands to generate a series of land use plans. All feasible land use combinations permitted by the input constraints will be examined, using the digital computer. Those ranking best based on either total cost, total benefits, overall cost-benefit ratio or total employment generated will be listed. Each plan will produce the following output data:

- Total quantity of land allocated to each use by land use categories.

- Total of costs and benefits and overall cost-benefit ratio for each land use category.

- Total costs, benefits, and overall cost-benefit ratio for the plan.

- Total increase in employment attributable to the plan.

Tabulating data related to quantity of land required for each use, suitability of land increments to various uses, and planning concept constraints for computer analysis will permit revision of planning at any time that new data is developed.

The implementation of the recommended plan or plans will be time phased over five year periods so that existing facilities to be replaced can be phased out in an orderly and economic fashion and new developments added to meet the anticipated absorption rate.

The preceding plans will be generated for the year 1985 in order to establish proper interrelationship between land uses for the ultimate plan. The constraints of the ultimate development will be applied to the land use requirements forecast successively for 1980 and 1975 to produce interim phasing plans.

D. Plan Series Two — Economic Plus Non-Economic Land Uses

The second series of plans will be generated in a manner similar to the first except that physically qualified non-economic land uses will be incorporated into the input data.

The input data to the second series of plans can be programmed to provide for increasing increments of non-economic land uses. Comparison of these plans will then illustrate the variation in overall plan cost-benefit ratios associated with successive increases in non-economic land uses.

E. Plan Presentation

The most attractive plans within each concept will be presented graphically.

Plans will be shown in conceptual form in such a fashion as to clearly illustrate the recommended land. Plans will not include design configuration or details of recommended facilities.

Plans will show the land use category established for each land increment. Maritime uses will be divided into major terminal types. Industrial uses will be divided into heavy industry and other industry. Residential uses will be divided into high density and medium or low density. Other land uses will be considered as single categories.

In addition to land uses, plans will include projected road and rail transportation networks as presently conceived by applicable city agencies. The study will not define future transportation requirements or plan future land transportation interfaces or systems.

Plans will be presented in final 1985 form with transparent overlays utilized to block out 1980 and 1975 developments to show the phasing processes for each plan. It is estimated that approximately 5 plans in each series will be found to be sufficiently attractive to merit this complete a presentation. Finally, a ranking of plans in both series according to comparative cost-benefit ratios will be made. The first series can then be compared to the second series to determine the differential costs and benefits associated with the inclusion of various increments of non-economic land use.

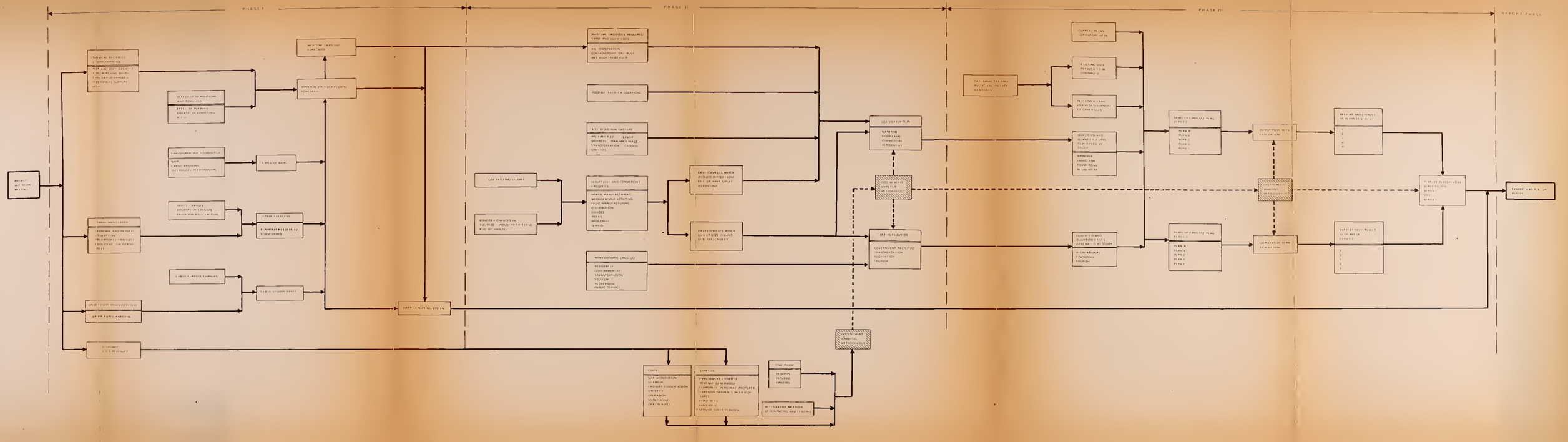
FINAL REPORT

The findings and conclusions of the study will be presented in an attractive, hard-cover, bound report which will be printed on high grade stock and will contain four color illustrations of the optimized plans. Additional maps, tables and graphs in two and four colors will be included.

This brochure will be of the highest quality for effective presentation of the study's conclusions to interested city agencies and other parties.

Fifty copies of the complete report will be provided. Five hundred copies of a condensed, soft cover executive summary suitable for wider distribution will also be provided.

WORK PLAN & SCHEDULE


PHASE I
PHASE II
PHASE III
REPORT PHASE
AIRCRAFT NOISE CONTOURS
INDUSTRIAL FACILITIES LABOR REQUIREMENTS
NEW AIRPORT EFFECTS ON EXISTING SURFACE TRANSPORTATION FACILITIES
EFFECTS OF DEMOLITIONS AND RELOCATIONS
LEVEL OF PLANNING DETAIL IN GRAPHIC WORK
TRANSPORTATION TECHNOLOGY SHIPS
SHIPS AMENDING DISTRIBUTION
TRAFFIC CHANGES POSITIVE TRAFFIC ENVIRONMENTAL EFFECTS
TRADE FACTORS
TEMPORARY EFFECTS OF CONSTRUCTION
TRADE ANTICIPATED
EMPLOYMENT AND PAYROLL EVALUATION
RECREATIONAL FACILITIES
BUSINESS FOR CARGO TRUCK
LABOR FORCE CHANGES
FABRICATION UNITS
EMPLOYMENT/POPULATION LIST
FIRM SIZES ANALYSIS
ECONOMY
CITY REVENUES
WATER AND SEWER REQUIREMENTS
WASTEWATER TREATMENT REQUIREMENTS CONCEPTS
WATER AND SEWER REQUIREMENTS CONCEPTS
WATER TREATING SYSTEM
WASTEWATER FACILITIES REQUIRED TYPES AND LOCATIONS
RE-CONSTRUCTION CONTAINMENT ON-SITE AND OFF-SITE PROTOTYPE
POSSIBLE FACILITY LOCATIONS
SITE SELECTION FACTORS
PROXIMITY TO LABOR MARKETS RAW MATERIALS TRANSPORTATION TRENDS UTILITIES
USE EXISTING STUDIES
CONSIDER CHANGES IN ECONOMIC INDUSTRY PATTERNS AND TECHNOLOGY
INDUSTRIAL AND COMMERCIAL FACILITIES
HEAVY MANUFACTURING MEDIUM MANUFACTURING LIGHT MANUFACTURING DISTRIBUTION OFFICES RETAIL WHOLESALE SERVICE
DEVELOPMENTS WHICH REQUIRE INTERACTION BUT OR MAY GAIN ADVANTAGE
DEVELOPMENTS WHICH CAN UTILIZE ISOLATED SITE EFFECTIVELY
NON-ECONOMIC LAND USE
RESIDENTIAL GOVERNMENT TRANSPORTATION TOURISM RECREATION PUBLIC SERVICE
USE EVALUATION
MAXIMUM INDUSTRIAL COMMERCIAL ATTRACTIVE
CONSTRAINTS ANALYSIS
GOVERNMENT FACILITIES TRANSPORTATION RECREATION TOURISM
USE EVALUATION
CONSTRAINTS ANALYSIS
INTERIM LAND USE POLICY RECOMMENDATIONS
CURRENT PLANS COMPLETIONS DATES
EXISTING USES PLANNED TO BE CONTINUED
REVISIONS LIKELY FOR REDEVELOPMENT OR OTHER USES
QUALIFIED AND QUANTIFIED USES CLASSIFIED BY STUDY
MARITIME INDUSTRIAL COMMERCIAL RECREATIONAL
QUALIFIED AND QUANTIFIED USES GENERATED BY STUDY
AGRICULTURAL TRANSPORT TOURISM
DEVELOP LAND USE PLAN SCHEME
PLAN A
PLAN B
PLAN C
PLAN D
PLAN E
DEVELOP LAND USE PLAN SCHEME
PLAN A
PLAN B
PLAN C
PLAN D
PLAN E
QUANTITATIVE ANALYSIS AND EVALUATION
QUANTITATIVE ANALYSIS AND EVALUATION
QUANTITATIVE ANALYSIS AND EVALUATION
IMPLEMENTATION OF PLANS IN SCHEDULE
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IMPLEMENTATION OF PLANS IN SCHEDULE
1
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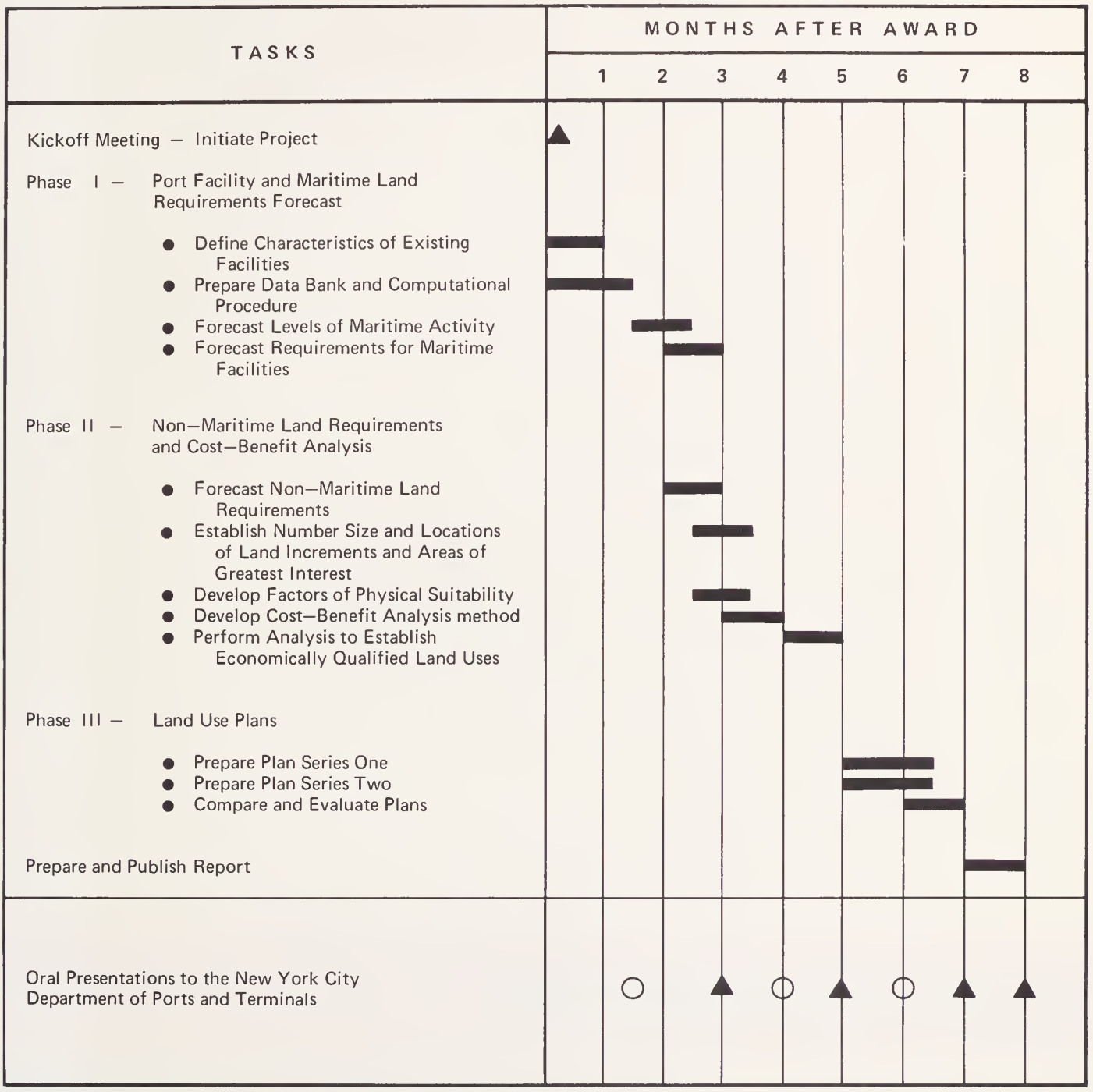
5
PLANNED ENVIRONMENTAL LIMITATIONS IMPACTS AND BENEFITS
REPORT AND PLAN OF ACTION
COSTS
SITE ACQUISITION SITE WORK FACILITY CONSTRUCTION UTILITIES OPERATION MAINTENANCE OFF SITE WORK
BENEFITS
EMPLOYMENT CREATED REVENUE GENERATED CORPORATE PERSONAL PROPERTY TAX/SALES TAX PAYMENTS IN LIEU OF TAXES LEASE FEES ROYALTIES REVENUE COSTS TO PUBLIC
TIME PHASE
1970-1975
1975-1980
1980-1985
ALTERNATIVE METHODS OF FINANCING AND TIMING
COST/BENEFIT ANALYSIS AND RECOMMENDATIONS

WATERFRONT LAND USE PLAN – CITY OF NEW YORK

PROJECT SCHEDULE


TASKS
MONTHS AFTER AWARD
1
2
3
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6
7
8
Kickoff Meeting – Initiate Project
Phase I – Port Facility and Maritime Land Requirements Forecast
● Define Characteristics of Existing Facilities
● Prepare Data Bank and Computational Procedure
● Forecast Levels of Maritime Activity
● Forecast Requirements for Maritime Facilities
Phase II – Non–Maritime Land Requirements and Cost–Benefit Analysis
● Forecast Non–Maritime Land Requirements
● Establish Number Size and Locations of Land Increments and Areas of Greatest Interest
● Develop Factors of Physical Suitability
● Develop Cost–Benefit Analysis method
● Perform Analysis to Establish Economically Qualified Land Uses
Phase III – Land Use Plans
● Prepare Plan Series One
● Prepare Plan Series Two
● Compare and Evaluate Plans
Prepare and Publish Report
Oral Presentations to the New York City Department of Ports and Terminals

○ INTERIM PROGRESS PRESENTATION

▲ COMPLETION-OF-PHASE PRESENTATION

ORGANIZATION

CORPORATE ORGANIZATION

Bechtel Corporation is the outgrowth of a family construction business established in 1898. During the early years, the Company participated in the construction of railroads, the Hoover Dam, and the San Francisco-Oakland Bay Bridge. Throughout its long life, the Company has enjoyed a steady growth in business volume, scope of services, and geographical spread of activities. Headquarters are maintained in San Francisco, with major offices in Los Angeles, Washington, D.C., Toronto, Paris, London, The Hague, and Melbourne.

Activities are geared principally to such basic fields as marine facilities, food processing, land use and development, paper, cement, power, mining, ore processing and metallurgy, and heavy industrial plants. In the public sector, the firm is active in water use and conservation, saline water conversion, rapid transit, and in the missile and space programs.

The Corporation is organized into eight operating divisions and a Scientific Development Department. Corporation management is handled by a team of men whose technical and administrative abilities have been demonstrated by exceptional performance in both government and private industrial programs. Successful completion of many far-reaching programs, both large and small, some of which pressed the state-of-the-art, attest to the effectiveness of our operations.

THE VERNON DIVISION SERVES INDUSTRY AND GOVERNMENT

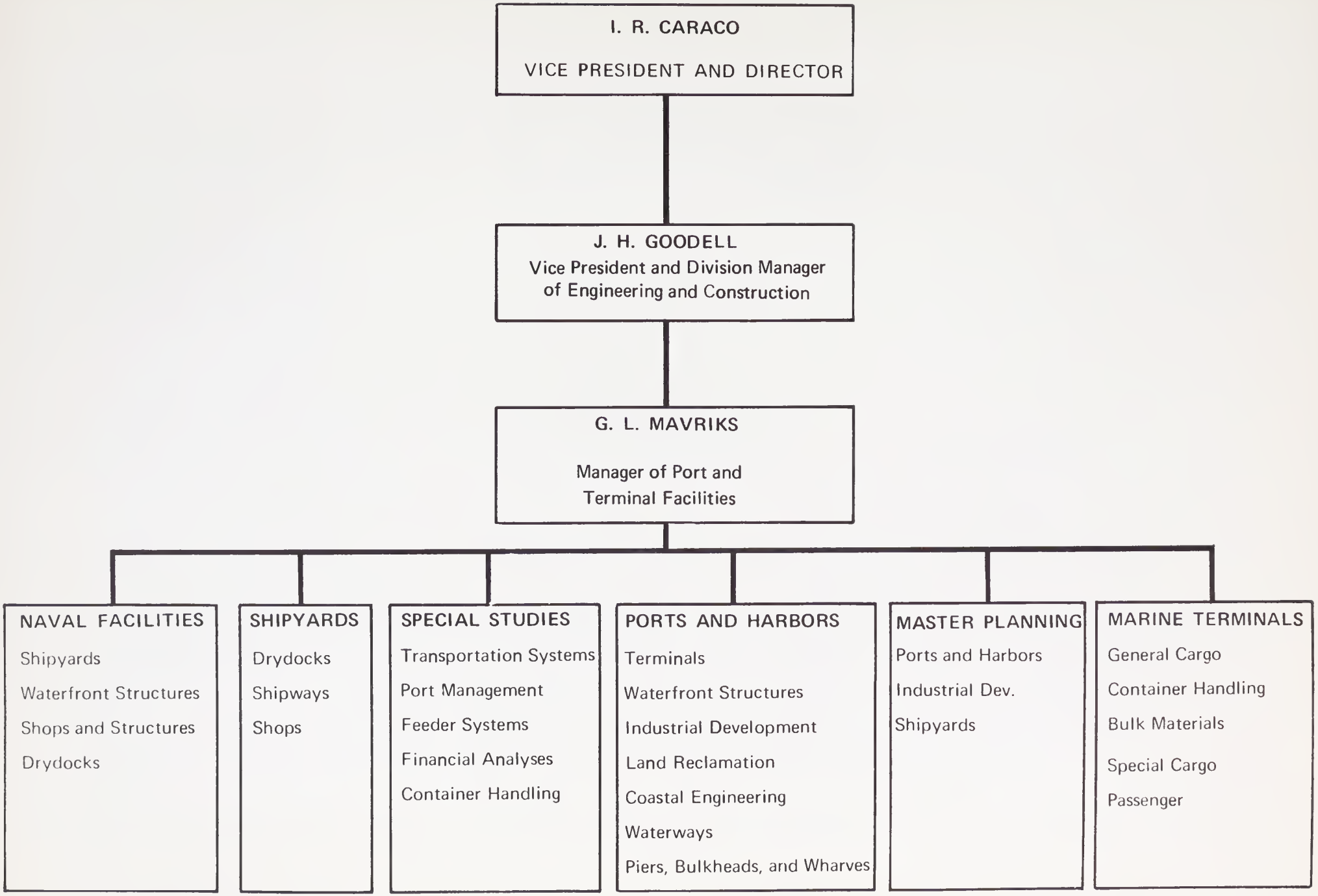
The Vernon Division, located in the Los Angeles area is the division primarily responsible for the acquisition and execution of marine facilities projects. During its more than 20 years of service to its clients, Vernon Division engineers have been leaders in the development of industry and supporting utilities, including the design and construction of conventional and nuclear power plants and the application of automation techniques to power plant operation.

Our staff includes land planners, architects, marine engineers, economists, food process engineers, instrumentation and control engineers, electrical specialists in plant manufacturing and layout, industrial process, heating, ventilating, and air conditioning, and interior design of offices, lobbies, and cafeterias.

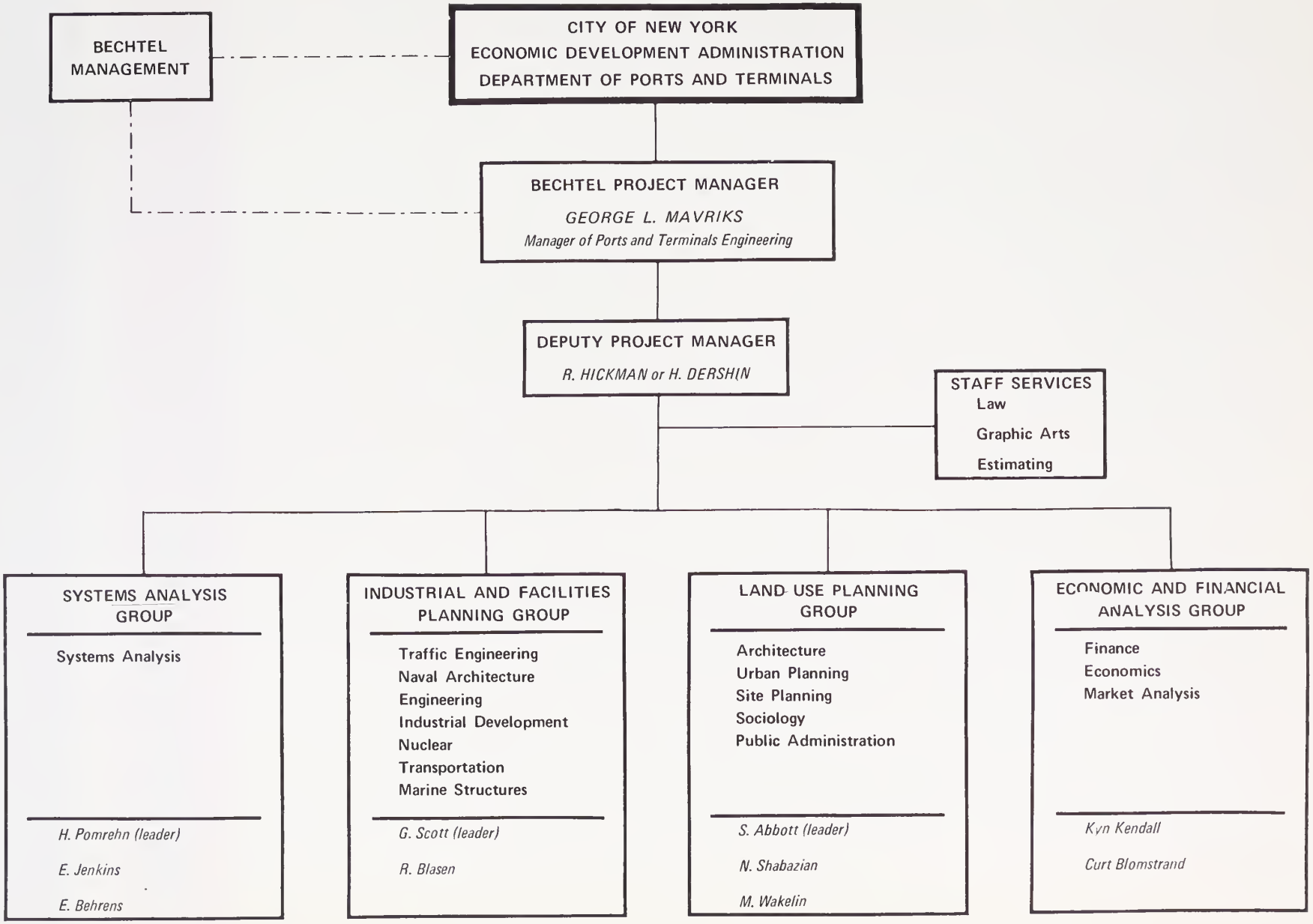
Prior to World War II, Bechtel was part of a joint venture chosen by the United States Navy to construct naval bases and air fields in the Philippines, Guam, Wake, Midway, Hawaii, Palmyra, and Johnston Islands. During World War II, Bechtel designed, constructed, and operated Calship and Marinship, two shipyards that built 540 cargo ships and tankers for the U.S. Navy. After the war, our engineers drew on this experience to engineer and design port facilities in such widely scattered places as Aden, the United Kingdom, South America, and the United States in support of industrial facilities that the company was also constructing. Our recent experience in the design and development of port and harbor facilities spans the last 30 years.

Bechtel uses the project concept for a program operation. Project teams operate as independent elements that call upon all technical experience and capability within Bechtel's eight divisions necessary to support a particular program. When a project calls for technologies beyond the scope of any office, the capability of all offices and divisions is available. The effect is a flexible, fast moving network of capabilities that cuts through red tape and gets the job done.

Vernon Division's facilities currently accommodate approximately 1300 people, of whom 862 are professional and technical personnel performing engineering design work. This staff is housed in six buildings in close proximity and is supported by modern computing machines, design and drafting equipment, reproduction services, and a technical library.



BECHTEL CORPORATION – VERNON DIVISION


BECHTEL MANAGEMENT
CITY OF NEW YORK
ECONOMIC DEVELOPMENT ADMINISTRATION
DEPARTMENT OF PORTS AND TERMINALS
BECHTEL PROJECT MANAGER
GEORGE L. MAVRIKS
Manager of Ports and Terminals Engineering
DEPUTY PROJECT MANAGER
R. HICKMAN or H. DERSHIN
STAFF SERVICES
Law
Graphic Arts
Estimating
SYSTEMS ANALYSIS GROUP
Systems Analysis
H. Pomrehn (leader)
E. Jenkins
E. Behrens
INDUSTRIAL AND FACILITIES PLANNING GROUP
Traffic Engineering
Naval Architecture
Engineering
Industrial Development
Nuclear
Transportation
Marine Structures
G. Scott (leader)
R. Blasen
LAND USE PLANNING GROUP
Architecture
Urban Planning
Site Planning
Sociology
Public Administration
S. Abbott (leader)
N. Shabazian
M. Wakelin
ECONOMIC AND FINANCIAL ANALYSIS GROUP
Finance
Economics
Market Analysis
Kyn Kendall
Curt Blomstrand

PERSONNEL

BECHTEL'S PERSONNEL RESOURCES

Bechtel Corporation currently employs approximately 7,000 non-manual employees. Of these, more than 3,500 are engineers and draftsmen assigned to various design projects. This figure does not include engineers serving in other technical functions such as estimating, scheduling, purchasing, or administrative and support functions. Bechtel's engineers are registered in 41 states and in 42 countries — total of 1,822 registrations.

Bechtel engineers received their degrees from a broad educational base — 159 accredited universities in the United States and Canada and 93 universities in foreign lands. Company personnel have 2,817 bachelor of science degrees and 412 advanced degrees.

A large number of current projects at Bechtel not only provides stability, but also furnishes a large reservoir of engineers available in the months immediately ahead. At least 50 major projects are under design at any one time; on the average, one major project is completed every week and another started. As a result, competent and experienced personnel continuously become available for new work.

Managing Bechtel Corporation and its far-reaching programs is a team whose technical and administrative abilities have been demonstrated during exceptional careers in defense programs and private industry. Using the project management concept for program operations, project teams operate as independent elements which may call upon all the technical experience and capability within Bechtel to the support of their project.

When a project calls for technologies beyond the normal scope of any one Bechtel office or division, the capability of all offices and divisions is available. The effect — a flexible fast-moving network of capabilities that cuts through red tape and gets the job done.

Bechtel's staff includes highly qualified administrative, engineering, and construction personnel. These individuals have the depth of knowledge and experience in their respective fields to enhance Bechtel's broad capability in engineering and construction.

PERSONNEL RESUMES

The resumes on the following pages indicate the caliber of personnel available to take part in the Waterfront Land Use Plan for the City of New York. The resumes are arranged in five groups for your convenience.

MANAGEMENT

A. Boeke	—	Manager of Community and Land Development
G. Mavriks	—	Manager of Ports and Terminals Engineering

MARINE TECHNOLOGISTS

R. Blasen	—	Engineering Supervisor, Marine Mechanical Specialist
H. Dershin	—	Engineering Supervisor, Marine Mechanical Specialist
R. Hickman	—	Marine Project Manager, Port Planning, Harbor Development
A. Lewis	—	Senior Marine Engineers, Port Administration Specialist
G. Scott	—	Project Engineer, Marine Civil Engineering

PLANNERS

H. Abbott	—	Senior Architect, Industrial and Commercial Specialist
L. Frank	—	Senior Planner, Political Analysis and Urban Design
L. Rosenfeld	—	Chief Planner and Manager of Planning Projects
S. Tolkin	—	Senior Planner, Urban Development Specialist
M. Wakelin	—	Senior Planner, Specialist in Regional Development

SPECIALISTS

S. Aranoff	—	Staff Economist, Research Analyst and Marketing Consultant
C. Blomstrand	—	Staff Economist
S. Burney	—	Project Civil Engineer, Surveying
D. Campbell	—	Senior Geologist, Specialist in Hydro and Marine Projects
C. Delaplain	—	Senior Estimator, Civil Engineering Evaluation
P. Freeman	—	Civil Engineering Supervisor, Transportation Specialist
K. Kendall	—	Regional Economist, Market Analysis
E. Rose	—	Soils Engineer and Ocean Engineer

SYSTEMS ANALYSTS

G. Wang	—	Chief Systems Analysis Engineer
E. Jenkins	—	Systems Analyst
H. Pomrehn	—	Senior Systems Analyst

MANAGEMENT

ALFRED BOEKE

Education: Bachelor of Architecture, University of Southern California, Cum Laude
Graduate studies in city planning and urban design, USC

Summary:

Present: Manager, Community Planning and Land Development at Vernon and Vice President of Bechtel International

9 Years: Vice President, Operations for Oceanic Properties Inc., responsible for community projects, corporate profit, planning and design

2 Years: Administrator of Land Planning and Development for the Dole Corporation, responsible for new community planning and development, and land development

12 Years: Private practice and association with several architectural firms in Southern California - urban planning; commercial, educational, and housing design

Experience: Mr. Boeke is in charge of all community planning and land development. These projects include city and regional planning, urban development and redevelopment, commercial development, ports and terminals master planning, urban and land economics, and the construction of community development.

Prior to joining Bechtel he was a member of the board of directors of Oceanic Properties Inc., and Vice President in charge of planning, development, construction, and corporate profit for several community scale developments. Mr. Mr. Boeke also served as Vice President and General Manager of Mililani Town, Inc. In this position he was responsible for all aspects of this community's planning and development.

Mr. Boeke suspended private practice to join Dole Corporation as Administrator of Land Planning and Development. In this position he was responsible for the planning, development, and construction of a new town in Waipio, Hawaii.

Mr. Boeke's background includes twelve years of professional experience in commercial, industrial, educational, and housing design with several leading Southern California architectural and planning offices. He was in private practice for five years specializing urban design and architecture.

Professional Affiliations and Honors:

Member, American Institute of Architects
Member, Urban Land Institute
Member, American Society of Planning Officials

G. L. MAVRIKS

Education: B.S., Mechanical Engineering, Polytechnic Institute of Brooklyn
Graduate Studies, Marine Engineering, NYU
Eng. Officer License, U.S. Maritime Commission Academy

Summary:

Present: Bechtel Manager of Ports and Terminal Engineering. Complete responsibility for port development activities including industrial parks and other related facilities

14 Years: Bechtel project engineering responsibilities including SNAP-8 and San Onofre nuclear projects, gas and steam-turbine applications in a variety of fields, food processing and distribution, and industrial park development.

7 Years: Various responsible engineering assignments, including marine engineering, steam power plants, process chemical plants, naval architecture, and a variety of industrial plants

Experience: As Manager of Ports and Terminals, Mr. Mavriks has been responsible for a wide variety of projects, including the Amsterdam Petrochemical Center; Mariners Harbor Containership Terminal; Stapleton Oil Terminal; South Dade County Florida Seaport and Industrial Park; Long Beach, California Naval Facility for Atomic Vessels; Mariners Harbor Terminal Company Organization and Tariff Schedule Study; City of New York; Hunts Point Food Distribution Center; and the Todd Shipyard DX Program High Efficiency Shipyard Development.

Other recent projects include the Rockefeller Foundation Utility Beautification Program Study, Knudsen Creamery Company Plant, SNAP-8 Venus Probe Environmental Facility, San Onofre Nuclear Plant Pre-Conceptual Study, Coal Slurry Pipeline Feasibility Study, Combined Cycle Study for General Electric, Western United States Water Resources and Power Distribution Study, American Potash and Chemical New Facilities Study, and other miscellaneous, Industrial, Power, Space and Master Plans, projects, and studies.

In addition, he has five years experience in the practice of naval architecture and marine engineering and has served as an assistant port engineer for a steamship company.

Professional Affiliations:

Registered Professional Engineer, New York
Registered Mechanical Engineer, California
Registered Professional Engineer, Illinois

MARINE TECHNOLOGISTS

R. M. BLASEN

Education: B.S., Mechanical Engineering, Oregon State University

Summary:

Present: Bechtel Engineering Supervisor, specializing in the mechanical design of seaport, shipyard and industrial facilities

9 Years: Consulting Engineer involved in designing and building heavy machinery, processing plants, materials handling systems, and marine facilities

12 Years: Mechanical Design Engineer, participating in Design Engineering for the manufacturing, materials handling, processing, and marine industries

Experience:

Mr. Blasen has accomplished a wide variety of recent projects including designs for ocean tugs, a 9000 ton floating drydock, ocean barges, a side transfer marine railway, and other shipyard facilities for the Dillingham Corporation of Honolulu.

The Portland Dock Commission retained him at intervals over an 8 year period for design consultation involving port crane modifications, bulk cargo handling equipment, special machinery, a Matson container crane, and other container facilities.

Prior work in material handling involved grain terminals, chemical and food processing plants, bakeries and flour mills, automated fertilizer batching systems, and a high capacity alumina ship discharging and car loading system for the Port of Longview, Washington.

Other marine experience includes ship conversion, design of a self-unloading bulk cargo barge, ship repairs, and the conversion of the first automated self-unloading bulk cargo vessel to carry edible rice.

Previous heavy machine building experience related to mining and gold dredging machinery, plywood and wood processing plants, paper mills, and the transportation industry.

Professional Affiliations:

Registered Mechanical Engineer, California and Hawaii
Registered Naval Architect, Oregon and Washington

H. DERSHIN

Education: B.S., Mechanical Engineering, City College of New York
M.S., Mechanical Engineering, University of California at Los Angeles

Summary:

Present: Engineering Supervisor, reporting to Manager of Port Development and Terminal Facilities

11 Years: Management and engineering responsibilities at General Dynamics Corporation

Experience: Mr. Dershin is currently involved in engineering and planning studies for port and terminal development. Included are land utilization studies for the Port of New York, and the development of a mobile emergency port package to provide for emergency unloading of cargoes, such as unloading at ports damaged by natural or accidental disasters, or unloading across open beaches.

Prior to joining Bechtel, Mr. Dershin was Section Head of Aerothermodynamics at General Dynamics Pomona Division. He was responsible for all division activities in aerodynamics, thermodynamics, heat transfer, propulsion, and ordnance. Mr. Dershin also served in an advisory capacity on Aerospace Industry Association and Navy Committees concerned with development of advanced technology.

Before his promotion to Section Head, Mr. Dershin was Assistant Section Head, Physics, at General Dynamics, Pomona. His responsibilities included project management, and planning and technical direction for a broad scope of projects. These projects included the development of microelectronics capability, advanced missile seeker systems and detectors, a gas bearing gyroscope, and advanced laser systems.

Mr. Dershin taught heat transfer at California Polytechnic, Pomona, and has published several technical papers in professional and international journals.

Professional Affiliations:

Member, American Institute of Aeronautics and Astronautics

R. S. HICKMAN

Education: B.S., Marine Engineering, United States Merchant Marine Academy
Graduate studies in Engineering Economics, Government Procurement, and Contract Administration, UCLA and USC

Summary:

1 Year: Project Manager, Industrial Seaport conceptual design and economic feasibility studies

12 Years: Mechanical Design Engineer, specializing in the design of transportation terminals and process systems for steam power plants; and design, manufacturing, and marketing of equipment for aircraft, missile, and ground support systems and facilities

6 Years: Marine Engineer on various merchant and naval vessels in world-wide service

Experience: Mr. Hickman has recently completed an assignment as Project Manager for the conceptual design and economic feasibility study of an integrated, combination industrial park and seaport on a previously undeveloped site in the southern part of Florida. Prior assignments include an economic study to establish the organizational, operational, and financial requirements for a major containership terminal in New York City, and the conceptual design and construction of Texaco's Los Angeles Marine terminal. His responsibilities included optimizing terminal facility interfaces with transportation equipment and specializing in design of fuel handling and fire protection systems. Mr. Hickman has also participated in conceptual design, economic feasibility studies, and construction design of Marsden Point Power Station in New Zealand and Alamitos Generating Station at Long Beach.

Prior to joining Bechtel, Mr. Hickman participated in the design, manufacturing, and marketing of equipment for service in fuel, hydraulic, pneumatic, and environmental control systems for commercial and military aircraft, missiles, and ground support facilities.

As a Marine Engineer Mr. Hickman was responsible for the operation, maintenance, and overhaul of all shipboard engineering and hull systems on various types of vessels including bulk oil carriers, passenger cargo vessels, and aircraft carriers. In addition, Mr. Hickman participated in the management of operation of shipboard process and cargo handling systems for general cargo, bulk petroleum products, and containerized cargo.

Professional Affiliations:

Licensed Chief Engineer of Ocean Steam Vessels of unlimited horsepower and tonnage
Member, Propellor Club, Port of Los Angeles—Long Beach Chapter

A. E. LEWIS

Education: B.S., United States Coast Guard Academy; Management Courses at the University of Hawaii

Summary: Present: Employed by Bechtel as a Senior Engineer

24 Years: Service in the United States Coast Guard; retired as a Captain

Experience: Mr. Lewis joined Bechtel Corporation in May 1968 after retiring from the United States Coast Guard. Since that time he has been the Bechtel project manager for a feasibility study of mobile emergency port facilities for the Maritime Administration, U.S. Department of Commerce.

His last Coast Guard assignment was Captain of the Port and Base Commander in the Philadelphia Area. During this assignment he was responsible for safeguarding vessels and waterfront facilities from loss or injury due to accidents or overt acts. He was supervised the administration of dangerous cargo regulations, search and rescue services, operating and manufacturing of repair aids to navigation, logistic support to vessels, and development planning to update facilities and plant.

Mr. Lewis spent ten years on seagoing ships, six of them as commanding officer. His vessels provided assistance to trans-Pacific aircraft and vessels, scientific data collection projects, and the operation and maintenance of aids to navigation. He was also responsible for and actively administered training, logistics, engineering, and planning functions.

During another period, he was Manager of Personnel Matters for 2400 military and civilian personnel in a Coast Guard district. In this position he supervised the administration of all personnel matters including assignments, medical services, sanitation programs, budget requirements, discipline, housing, travel, procurement, and planning for emergency employment.

Other responsibilities have included the direction of Reserve personnel administration, training and mobilization planning, planning for normal and emergency operations and logistic support, the design and development of aids to navigation systems utilizing optical, acoustical and electronic equipment, and the supervision of field units.

Professional Affiliations:

Member, Society of American Military Engineers
U.S. Coast Guard, retired

GORDON L. C. SCOTT

Education: B.S., Civil Engineering, Oregon State University
M.S., Civil Engineering, University of Illinois
Graduate Studies, Latin American Foreign Affairs, University of Michigan

Summary:

Present: Project Engineer of Marine Terminal Projects

7 Years: Consulting Engineer in heavy marine construction, container facilities, industrial park development, cargo trends and port capacity factors, long-range technological forecasting and industrial site studies

4 Years: Chief Engineer for heavy construction contractors

13 Years: Regular officer in the Corps of Engineers, U. S. Army, involving economic, atomic test and research and development assignments

Experience: For over a quarter of a century Mr. Scott has had broad experience in the fields of management, construction, planning, engineering, economics and business administration. He has supervised design layout and construction supervision for major amphibious operations, ports and harbours, highway and railroad systems and industrial complexes.

He spent several years directly assisting in the economic, financial and political rehabilitation of Western Germany; was Chief Engineer equipment test officer at the Frenchman's Flat atomic tests; and was Department Director of the Waterways Experiment Station involving experimental research in coastal engineering, river and estuarine hydraulics, model studies of locks, dams and other waterway works.

Economic research, container-suitable traffic projections, container facility design and construction supervision for both yard facilities and handling equipment have recent strong commitments in Mr. Scott's experience.

Professional Affiliations:

Registered Professional Engineer in Oregon and Washington
Member, International Cargo Handling Association
Member, Urban Land Institute
Contributing Member, American Association of Port Authorities, Pacific Coast Association of Port Authorities, Propeller Club of America

PLANNERS

S. HOWARD ABBOTT

Education: Mr. Abbott received his architectural and general art education at the University of California and the Art Center School, Los Angeles

Summary:

10 Years: Bechtel Senior Architect, Designer, and Manager for Commercial, Industrial and Research Projects

7 Years: Designer, and Chief Draftsman, for various architects and General Partner in private practice involving residential, commercial and industrial activities

Experience: Mr. Abbott is presently assisting the site evaluation team for the redevelopment of the port of New Orleans. In his previous assignment he was responsible for the development of an economic impact study. The study analyzed the effect of a major government contract on the State of Maine. This study covered the impact on labor, housing, per capita income, wholesale and retain business, manufacturing, taxes, schools, medical services, and governmental services. He was the Project manager for a 25,000-student campus site selection for the University of California. The site evaluation for this project included an assessment of the physical characteristics of the sites (over 50 were evaluated), the effect of urbanization, transportation and economic considerations. He was the Project Architect on a medical school for the University of Toronto. Mr. Abbott has also served as Project Manager for the development of a master plan for the Samuel Merrit Hospital in Oakland, California. This was a 75-acre regional medical complex.

Mr. Abbott's background covers all phases of architecture. In addition he has conducted many feasibility and cost/benefit studies for industrial and commercial projects. One such study was related to utility practices and the economic feasibility of undergrounding electrical distribution lines and related cost/benefits.

Mr. Abbott was Senior Designer for the interiors and architectural departments of Cunneen Company of Philadelphia and Los Angeles, where he specialized in banking and financial institutions. He held the positions of Chief Draftsman and Office Manager for Willard T. Jordan, Architect; Associate Partner in the firm of Weldon J. Fulton Associates, Architects and Engineers; and general partner in the firm of Abbott, Botich and Munns, Architects and Engineers.

Professional Affiliations:

Registered Architect, California

LEONARD FRANK

Education: B.A., Political Science, UCLA
Graduate Studies, City and Regional Planning, USC

Summary:

4 Years: Bechtel Senior Planner, responsible for various aspects of governmental coordination, political analysis, circulation, traffic, land use evaluation, urban renewal and redevelopment.

8 Years: Experience in master planning, land planning, community redevelopment, urban renewal, and project feasibility studies.

Experience:

Mr. Frank is currently responsible for a development study of three urban properties near Washington, D.C. for Lehigh Portland Cement Co. Previously, he coordinated and analyzed the governmental aspects of several projects: the 3,000-acre Calabasas Park community development near Los Angeles; a site evaluation study of 51 potential locations for two new Northern California campuses for the University of California; the 12,000-acre Albertson Ranch community development in Southern California; and a study of the regional implications of three alternative Trans-Pacific Jetport sites on the Island of Hawaii.

While employed as Project Coordinator for a major national architectural planning organization, he participated in several large-scale planning projects. His responsibilities included precise planning and extensive documentation for the 50.6-acre federally-assisted Redondo Plaza urban renewal project involving residential, office, motel, commercial, and civic development; master planning, including a golf course and high density apartment development, for a 138 acre urban site planning of the 14,000-acre Phoenix, Arizona, Goodyear Farms new community; comprehensive research regarding political, social, and economic elements for master plans for the cities of Alhambra and Monrovia; and economic base research for the 3,500-acre Warner Ranch (now Calabasas Park) development.

As Project Planner for a Newmark, New Jersey Planning Firm, Mr. Frank participated in plan development of a 24-acre City of Long Beach urban renewal project and general plan studies for the Cities of Ventura, Santa Rosa, and Artesia.

Earlier planning assignments were with the City and County of Los Angeles on the Bunker Hill, Temple, Hoover, and Monterey Hills urban renewal projects; subdivision design; and variance and zone change processing. He also performed redevelopment feasibility studies for Van Nuys, San Pedro, and the Little Tokyo areas of Los Angeles.

Professional Affiliations:

Member, American Society of Planning Officials; Southern California Planning Congress; Southern California Regional Plan Association; and San Francisco Planning and Urban Renewal Organization (SPUR).

L. L. ROSENFELD

Education: Ecole Nationale Superieure des Beaux Arts, Paris France
Bachelor of Architecture, Pratt Institute, New York
Graduate studies, UCLA

Summary:

Present: Bechtel Chief Planner and Manager of Planning Projects

13 Years: Numerous worldwide master planning and architectural assignments on new community, urban renewal, military, industrial, recreational, and commercial projects

Experience: Mr. Rozenfeld has had total project responsibilities on all Bechtel planning projects. Among the new communities are Westlake Village for 70,000 persons near Los Angeles; Crocker Hills, on 3,000 acres near San Francisco; Lloyd Corporation's 4,000-acre property in Ventura, California; and a water-oriented, 3,800-acre community near Stockton, California. Residential marine projects include one in southern Spain and another on Grand Bahama Island. He directed a regional study of the 30,000-acre Hackensack Meadow in northern New Jersey and had planning responsibility for the University of California's new campus site evaluation study in Northern California. Two petrochemical centers, one in Amsterdam and the other in Nova Scotia, have been planned under his management. Industrial planning projects include the Olin Mathieson Chemicals Group's Administrative and Research Center, Stamford, Connecticut; North American Aviation's Seal Beach Facility; the Hydraulics Research Facility near Los Angeles; and the Solar Research and Manufacturing Facility in San Diego, California.

Prior to coming to the United States, Mr. Rozenfeld was Site Detailer for the U.S. Air Force in Europe. While in New York, he was an Architectural Designer on residential and commercial projects. Before joining Bechtel, Mr. Rozenfeld was employed as a Project Coordinator and Chief Planner with three of the largest architectural/planning firms in the U.S.A. In this capacity, he was responsible for various city and regional plans, some of which were: City of Oxnard — downtown redevelopment; City of Palo Alto — general plan, downtown redevelopment program, and Master Plan for 7,000 acres in the foothill area; Core Area Study and Master Plan for the cities of Syracuse and Lockport, New York.

Professional Affiliations:

Registered Architect, California
Member, American Society of Planning Officials
Member, National Association of Housing and Redevelopment Officials
Member, Urban Land Institute
Member, Urban America
Associate Member, American Institute of Planners
Member, American Institute of Architects

S. M. TOLKIN

Education: Bachelor of Architecture, Columbia University
Master of Architecture in Urban Design, Harvard University

Summary: Present: Bechtel Senior Planner engaged in master planning and architectural design on a variety of urban development projects

7 Years: Experience as architect and planner on diverse projects while with firms in America and abroad.

Experience: While with Bechtel, Mr. Tolkin has been responsible for the design of the Loyola/Marymount University Campus in Los Angeles. This educational complex will integrate the activities of both schools, which were formerly conducted on separate campuses. On a prior assignment, he developed prototype housing designs for the Santa Catalina project.

Mr. Tolkin's recent experience includes detailed central city and central business district revitalization planning. He has also been responsible for comprehensive planning including land use, community facilities, and planned residential developments. Typical projects of this nature include a central area study for Huntington Park, California; a central area study for Menasha, Wisconsin, and a comprehensive plan for Menasha, Wisconsin.

Mr. Tolkin's recent experience as a designer encompasses design development, programming, site planning, and working drawings for 30-story apartment buildings and coordination of design and programming of a large building complex that included a 26-floor office tower and a 650-car parking facility. Typical of these projects are the married student housing facilities at New York University, and The Administrative Complex for the Mother Christian Science Church in Boston.

While employed as a design draftsman, Mr. Tolkin assisted in the design, development and programming for the Robert Morris Junior College Campus. His work on this project included site planning, and the design of dormitory and classroom buildings, for this Moon Township, Pennsylvania school. Another Pennsylvania project was the design for the American Institute of Research's 6-story headquarters psychological research institute in Pittsburgh. While employed by a firm in Tel Aviv, Israel, he designed biological research laboratories for the Wiezmann Institute.

Professional Affiliations:

Registered Architect, New York

MICHAEL H. WAKELIN

Education: Bachelor, Architecture, Cambridge University, United Kingdom
Master of Architecture and Diploma, Architecture, Cambridge University, U.K.
Recipient of Brancusi Travel Scholarship to U.S.A.

Summary: Present: Bechtel Senior Planner, responsible for university and college planning and participant in master planning and analysis of regional development projects.

7 Years: Varied experience in overall regional and urban master planning and in design aspects of major complexes, downtown renewal and regional shopping centers.

Experience: Mr. Wakelin is currently responsible for the community aspects of a comprehensive regional development plan study for Southeastern Iran. This study incorporates the development of agriculture, food processing, heavy industry, water, power, new communities, and tourism for an area of approximately 30,000 square miles.

He was previously engaged in the master planning of Loyola/Marymount Los Angeles, a project that will include facilities for many advanced instructional and educational concepts. Prior to this assignment, he participated in a regional study for the location of an Industrial Seaport in Dade County, Florida. Other projects include a study for a 7000-acre industrial park to include many plants involved in the manufacture and reprocessing of nuclear fuel; an envirnomental study for a proposed oil refinery and industrial park, including the location for a new community of 30,000 persons in Nova Scotia, Canada; and a site evaluation study for the University of California for a new, 27,500 student campus in northern California.

Before joining Bechtel, Mr. Wakelin was section head in the Civic Design Group in Cambridge, England. In this position he was responsible for the initial planning and design studies for a comprehensive redevelopment plan within the city, comprising commercial, civic, and university buildings. Concurrently he worked on a total revision of the city development plan for future expansion including a citywide traffic study, land use, and the subsequent policies required to implement the city's new goals and objectives.

As an Assistant Coordinator in the firm of Victor Gruen Associates, Mr. Wakelin worked on numerous projects in the United States and around the world, particularly major shopping center developments and urban renewal.

Professional Affiliations: Registered Architect, United Kingdom
Member, Society for College and University Planning (U.S.A.)

SPECIALISTS

STEVEN A. ARANOFF

Education: B.S., Business Administration, University of California at Los Angeles
M.B.A., Business Administration, University of California at Los Angeles

Summary:

2 Years: Bechtel Corporation staff economist. Duties include research and analytic studies of market development potential and marketing functions for planned communities

2 Years: Research analyst, Transamerica Research Corporation with research and analytic assignments on market location studies, real estate development assessments, and property and casualty insurance

1 Year: Public administration analyst, Real Estate Research Program, UCLA with assignments in urban land utilization and land costs

Experience: As staff economist, Mr. Aranoff is involved in economic, market and financial analyses for small and large land development projects. He assists the chief economist in determining and evaluating economic, market, and financial implications of land development projects in addition to conducting research and analytical studies of market development potentials. Earlier, he designed a computerized financial planning tool that applies a discounted cash flow technique and results in a rate of return on equity investment.

Before joining Bechtel, Mr. Aranoff was employed by Transamerica Research Corporation as a research analyst. His duties included research and analytical work on the following types of projects: market location studies – a series of statistically oriented studies that include an analysis of general economic trends in the market area and a forecast of market potential; an assessment of the major trends in the real estate development business, including an analysis of the developer, projections of future housing demand, and the relationship of residential financing to the demand for housing; an analysis of the property and casualty insurance industry including its basic operating trends, characteristics, and future outlook; and an analysis of the demand for an equestrian-oriented residential development in Southern California resulting in an indicated rate-of-sale for residential lots. As public administration analyst for the Real Estate Research Program, University of California at Los Angeles, he worked on projects contracted from the Housing and Home Finance Agency concerning urban land utilization and land costs, past, present, and future, in the San Fernando and San Gabriel Valleys.

CURT A. BLOMSTRAND

Education: M.S., Finance, San Fernando Valley State College
B.S., Finance, University of California at Los Angeles

Summary: 1-1/2 Years: Staff Economist for the Vernon Division, Bechtel Corporation

2 Years: Property Manager for Lakeside Apartments, Inc. and Sales Manager for Toluca Townhouse, Barclay, Hollander and Curci, Inc.

Experience: As Staff Economist, Mr. Blomstrand is involved in economic, market and financial analyses for large and small land development projects. He has performed specific marketing studies concerning: sales and building activity of high value housing in Southern California; market potential for high value apartment units in the Los Angeles area; merchandising approaches for residential lot programs; market penetration of proposed commercial facilities; market potential for second home communities at Santa Catalina Island and the Virgin Islands; tourist potential for undeveloped areas of Iran, the Virgin Islands and Santa Catalina Island; market feasibility for resort/hotel operations at Santa Catalina Island and the Virgin Islands; and various product definition and consumer profile studies. His work also involves financial implications of land development projects, economic trends in market areas, and forecasts of market potentials.

Prior to joining Bechtel, Mr. Blomstrand was a manager for Barclay, Hollander and Curci, Inc. His functions included serving as Property Manager of a 600 unit apartment complex. He was involved in developing marketing strategies and merchandising approaches for the multi-family residential market as well as the operational performance of the complex.

He also served as Sales Manager for a 300 unit condominium project. He was directly responsible for the sales program for the final increment of townhouses, closing out 3/4 million dollars of real estate.

Professional Affiliations:

Member, Young Home Builders Council
Member, Alpha Kappa Psi Business Fraternity
Licensed Real Estate Broker, California

A. S. **BURNEY**

Education: B.S. Civil Engineering, City College of New York

Summary:

Present: Planning and Land Development Project Engineer

3 Years: Manager of Engineering Programming, Jennings, Halderman & Hood, Santa Ana, California

6 Years: Partner, Senor & Burney, Consulting Engineer and Land Surveyor firm, Scarsdale, New York

7 Years: Junior and Assistant Civil Engineer, Sanitary Engineer, and Surveying Instructor in governmental and municipal facilities and projects

Experience: As Project Engineer at Calabasas, Mr. Burney was the Professional Engineer responsible for the supervision and direction of four survey crews in addition to being responsible for all work in grading sewerage, storm drainage, bridge design and road improvement design.

As Manager of Engineering Programming for Jennings, Halderman & Wood, Mr. Burney was in charge of writing original Civil Engineering programs for the MCR 315 computer. Some of the programs written in Fortran II include street improvements, cul-de-sacs, earthwork, seismic reduction, geodimeter reduction. One development for which Mr. Burney was completely responsible was a 1200-acre development that included 8000 dwelling units; schools; churches; neighborhood shopping; a regional shopping center; a golf course; and primary and secondary highways.

As a partner in Senor & Burney, he was engaged in projects involving commercial-industrial; educational-institutional; residential, recreational development; and municipal engineering. Mr. Burney's functions encompassed all areas of administration, planning, and supervision, including design, planning, studies and reports, writing of specifications, construction estimates; preparation of contract plans; submission of bids; letting of contracts; and construction supervision.

Professional Affiliations:

Registered Civil Engineer, State of California
Professional Engineer and Land Surveyor, State of New York
Member, American Society of Civil Engineers
Member, National Society of Professional Engineers

DAVID G. CAMPBELL

Education: B.A., Geology, University of Southern California
Graduate studies in Geology, USC

Summary: 11 Years: Bechtel Senior Geologist

10 Years: Broad experience as a geologist in hydro, groundwater, and residential projects

Experience: Mr. Campbell is presently Senior Geologist, in charge of Vernon Division's Geology Group. Recently, he directed the geological investigation for the Bolsa Island Nuclear Power and Desalting Project and the Rancho Seco Nuclear Power Plant, and supervised preparation of the geological reports. Mr. Campbell evaluated the effect of subsidence on the site proposed for Bolsa Island. He also delineated foundation conditions which it was necessary to determine during construction of the coal-fired plant at Harbor Beach, Michigan.

Other Bechtel projects for which Mr. Campbell had responsibility include the Meadows Hydroelectric Project in Washington (geologic feasibility). The Round Butte Hydroelectric Project in Oregon (feasibility, preliminary studies, and Resident Geologist during construction), and the Carmen-Smith Hydroelectric Project in Oregon (feasibility and preliminary geologic studies). These projects involved considerable exploratory drilling, construction of test and grouting adits, and alignment and construction of tunnels, shafts and raises. He also was field representative for Bechtel during the geologic investigations for Atlas silos in Texas, Oklahoma, New Mexico, and Nebraska. Additional projects include safety reviews of existing dams; geologic reconnaisance of numerous dam sites, tunnels, and pipelines; and special studies covering detailed mapping, seismic evaluations, and long range coal sources.

Mr. Campbell was Chief Geologist with the firm of F. Beach Leighton, a geology consultant specializing in hillside development. Prior to this, he was associated with the Los Angeles Department of Water and Power during investigation and construction of various reservoirs, tunnels, and pipelines.

Professional Affiliations:

Certified Geologist in the cities of Los Angeles and Ventura, and in Los Angeles, Ventura and Orange Counties
Member, Geological Society of America
Member, Association of Engineering Geologists
Member, Society of Economic Paleontologists and Mineralogists
Member, Marine Technology Society

CHARLES A. DELAPLAIN

Education: B.S., Mining Engineering, New Mexico School of Mines
Graduate studies in Business Administration, University of California

Summary:

13 Years: Bechtel Senior Estimator, responsible for cost estimating a wide variety of industrial and residential projects

9 Years: A varied background in design and field engineering, cost accounting, contract payments, scheduling, negotiating contracts, and cost estimating

Experience: Mr. Delaplain is currently concluding an assignment in Iran on the Bandar Abbas Regional Development Project. During this assignment, Mr. Delaplain has conducted a civil engineering evaluation of terrain for such future items as roads, sewers, water mains, drainage, and other utilities. He has also investigated natural resources in the region and their availability for future development and use as construction materials. Upon his return to the United States he will use this firsthand knowledge to prepare project estimates; he will also act as a part-time consultant to the Bandar Abbas Project's staff.

Mr. Delaplain has been Bechtel project estimator on numerous new community programs, cement plants, cargo handling facilities, deepwater piers, and naval pier facilities. Other recent assignments have been on the 12,000-acre Westlake Village Development, the 3,000-acre Calabasas Park Development, and the 6,000-acre Moreland Investment Development Program. He was responsible for master utility plans and also for comprehensive and detailed construction cost estimates of all components — buildings, structures, earthwork, utilities, streets — of these large scale new communities.

During the Atlas Facilities Program, he assisted in site selection and development, supervising the design of roads, drainage, sewage, grading, water supply, and other utilities. As Project Engineer at Fairchild and Vandenberg Air Force Bases, he was responsible for the civil-structural phases of missile launch facilities construction.

As Engineer with the East Bay Utility District, Oakland, California, he performed various functions on a 125 mile long, large-diameter water transmission line including land surveying, soils engineering, and pile driving inspection. With Development Resource Corporation of New York City, Mr. Delaplain was cooling engineer on the Dez Dam in Iran.

PAUL M. FREEMAN

Education: B.S., Civil Engineering (Transportation Option), Louisiana State University

Summary:

12 Years: Bechtel Civil Engineering Group Supervisor with responsibilities for master planning of facilities that encompass various traffic requirements for residential developments and governmental and industrial complexes

4 Years: Civil Engineer with E. M. Freeman and Associates, Shreveport, Louisiana engaged in traffic engineering assignments on residential, commercial, and industrial facilities

1 Year: Planning Engineer with East Baton Rouge City-Parish Planning Commission responsible for traffic and engineering planning

Experience: Mr. Freeman is Project Civil-Structural engineer for Sentinel Missile facilities, responsible for all structural design, site layout and planning. He has had numerous civil engineering responsibilities since joining Bechtel in 1956. His assignments have included master planning, structural design, and military facilities design on various complexes throughout the United States. Of particular interest are his traffic analysis and engineering tasks for numerous developments including Westlake Village, a 12,000-acre development for a population of 70,000; Crocker Hills in northern California, 3,600 acres for a population of 22,000; and Calabasas in southern California, 3,000 acres for a population of 12,000. Industrial and governmental projects on which he had similar responsibilities include two industrial parks for North American Aviation, at Seal Beach, California, and at Reno, Nevada; a Douglas Aircraft Company facility at Long Beach, California, which involved a circulation pattern and parking facilities for 16,000 vehicles; and the 100,000-acre Air Force Western Test Range at Vandenberg Air Force Base, where considerations included traffic circulation patterns, redevelopment of road systems, accident incidence, etc.

Other Bechtel assignments include traffic engineering and analysis for the Olin Mathiesen Research and Development Center at Stamford, Connecticut, for 1,200 vehicles; site development and civil-structural engineering for preliminary conceptual design of the FDL shipyard; traffic engineering for the Hunt's Point food market project; and traffic analysis and engineering for a containership terminal.

Mr. Freeman also has a valuable background in the commercial transportation media. He was employed by the East Baton Rouge City-Parish Planning Commission where he was concerned with all aspects of planning, including traffic engineering, urban zoning, and governmental zoning requirements on a regional basis. He then joined the firm of E. M. Freeman and Associates, Consulting Engineers in Shreveport, Louisiana. During four years with this firm he was engaged in a variety of planning and structural assignments including subdivision tracts, shopping center development, and bridge and highway design.

KYNOCH P. KENDALL

Education: B.S., M.S., University of California

Summary: Present: Regional Economist assigned to a comprehensive regional development plan for southeastern Iran. Study responsibilities include tourism, population, and industrial complex analysis

15 Years: Experience in economic and systems analysis, marketing research, operations research, application of mathematical modeling, applied statistics, and market penetration studies for federal, and local government agencies, industrial complexes, public utilities, and the food industry

Experience: Prior to joining Bechtel he was Senior Economist with Ralph M. Parsons Company. Responsible for studies of existing Corps of Engineers projects to check regional economic impact versus predicted: input/output analysis, and development of a methodology for future evaluations.

Prior to the Ralph M. Parsons position he was Project Economist with Daniel, Mann, Johnson & Mendenhall. Conducted demographic analysis of population characteristics of Los Angeles County; assisted in benefit-cost analysis of rapid transit; calculated detrimental and beneficial community impacts such as noise, traffic, increased property values, demand for land, and retail sales due to transit.

He was Assistant Manager of Operations for Dairy Fresh Products, Inc. Responsible for evaluation of market potential; developed a mathematical model to optimize marketing locations; analyzed minimum cost material handling methods; conducted cost effectiveness studies of alternate transportation methods; established an information base to use in evaluting future system changes.

Mr. Kendall was Economic Analyst and Marketing Research Analyst with Union Oil Company. Applied statistical and other analytical techniques to solution of problems in corporate economics, marketing economics, and market research. Techniques included multiple regression, seasonal and cyclical analysis, analysis of variance, sampling theory, linear programming and model building. A medium-sized IBM 650 computer was used in some projects.

Early in his career he was an Economic Analyst with Safeway Stores, Inc. Applied statistical analysis toward developing the optimum aging time for beef and lamb; edited, evaluated, and distributed economic letters to top management.

Professional Affiliations:

Member of American Marketing Association and American and Western Farm Economics Association

EDWARD ROSE

Education: B.S., Engineering, University of Southern California
Graduate studies in Geology, Ocean Engineering, and Soil Mechanics at UCLA and MIT

Summary:

9 Years: Bechtel Engineering Supervisor for soils engineering and varied civil engineering assignments. Project Soils Engineer on power plants, industrial sites, dams, missile sites, rapid transit systems, and planning studies.

2 Years: Assignments with U.S. Army Corps of Engineers in soil and foundation investigation programs.

Experience: Mr. Rose is responsible for planning and supervision of projects in the Vernon Division that involve soils engineering and hydrology studies. Currently, he is performing studies on Pennsylvania Electric Company's Fast Breeder Nuclear Reactor, and for the Valle de Mexico power plant. He is also the project soils engineer for the Bolsa Island Nuclear Power and Desalting Project and Rancho Seco Nuclear Generating Station. He has been responsible for soils foundation investigations and preliminary studies for the Sacramento Municipal Utility District's Nuclear Power Station, Texaco Refinery, San Francisco's new rapid transit system, Comanche Dam, and several large, new community development programs. During the past three years he has also been responsible for grading, hydrology, and soil and foundation studies for Franklin Point, Crocker Hills, Catalina Island, and Texaco Tank Farm projects.

Mr. Rose joined Bechtel as a Senior Field Engineer during construction of the Atlas F silo facilities in Roswell, New Mexico. He served with Bechtel's Hydro and Transportation Division in San Francisco where he performed initial planning of the foundation and soil investigation programs for the San Francisco Bay Area Rapid Transit District. During this period, he was also responsible for several design studies for hydroelectric, steam, and nuclear power plants and industrial projects.

Professional Affiliations:

Member, American Society of Civil Engineers

SYSTEMS ANALYSTS

GEORGE S. C. WANG

Education: B.S., Civil Engineering, University of Michigan
M.S., Civil Engineering, University of Michigan
M.S., Nuclear Engineering, University of Michigan
Doctoral Research in Nuclear Science, University of Michigan
Doctorial studies in Nuclear Engineering, UCLA

Title: Chief Nuclear Engineer, Vernon Division

Summary:

6 Years: Bechtel nuclear project engineering assignments including San Onofre Nuclear Generating Station, numerous nuclear studies, analyses, and various design reponsibilities

2 Years: Assistant Research Engineer for the University of Michigan Research Institute

Experience: Mr. Wang is currently Chief Nuclear Engineer for Bechtel's Vernon Division. Recently he was Nuclear Project Engineer on the San Onofre Nuclear Generating Station (SONGS) for Southern California Edison Company and for the Metropolitan Water District (MWD) Dual-Purpose Power and Desalting Plant studies. Previously, Mr. Wang was nuclear project engineer on a 450-Mwe nuclear power plant for Public Service Company of New Hampshire, a 650-Mwe nuclear power plant study for Babcock and Wilcox Company, a 300-Mwe nuclear power plant study for Salt River Power Company, and a dual-purpose nuclear power plant and water desalinization plant study for Southern California Edison Company.

Mr. Wang's responsibilities have included analysis and conceptual design, shielding design, radiation monitoring system design, radioactive waste disposal system evaluation, construction schedule, reactor hazards analysis, containment analysis, reactor siting, plant equipment arrangement, capital cost analysis, nuclear fuel cycle cost analysis, operation and maintenance cost analysis, and projection of advanced nuclear reactors, such as seed and blanket, SGR, D_2O, and HTGR. Earlier, he had performed neutron attenuation and activation studies on the SNAP-8 Flight Configuration Test Facility Project for the Atomic Energy Commission.

Before joining Bechtel, Mr. Wang was an Assistant Research Engineer with Engineering Research Institute, University of Michigan. His research included design of a neutron spectrometer, investigations into neutron diffraction, growth of a large single crystals for X-ray and neutron studies, and electron spin resonance study on neutron-induced free radicals in amino acids.

Professional Affiliations:

Member, American Society of Civil Engineers
Member, American Nuclear Society
Member, Chi Epsilon (Civil Engineers' Honorary Society)

ELEANOR JENKINS

Education: B.A., Mathematics, University of California at Riverside
Graduate studies in Advanced Applied Analysis, UCR, and in Central Station Power Systems at UCLA Extension

Summary:

Present: System's Analysis Requirements on the USAF Hardrock Silo Program and Sentinel ABM System.

1 Year: Systems analysis for air-launched missile operations of the USN.

Experience: Mrs. Jenkins is presently involved in the Systems Requirements Analysis on the USAF Hardrock Silo Development Program. She also participates in the Sentinel power plant studies related to reliability/availability. In addition, Mrs. Jenkins is conducting manpower requirement and technological forecast studies.

As a member of the Systems Requirements Analysis Group on the Hardrock Silo Development Program, Mrs. Jenkins is performing overall systems analyses to integrate the continuous output of individual analytical efforts. This includes consideration of the impact of particular designs on reliability, maintenance, personnel requirements, and readiness.

In the areas of manpower planning and technological forecasting, she is currently testing and developing a computerized method for predicting manpower needs in various technical disciplines.

She was assigned to the Sentinel program as a systems engineer and as such conducted site analyses and participated in the overall systems analysis effort. This assignment involved the analysis of prime movers and power supplies, including the development of mathematical models of missile site facilities for radar systems. She was also responsible for the development of the reliability requirements for another government project. Earlier, she was responsible for data retrieval, reduction, cause/effect studies, and environmental analysis for the microwave stations of a large public utility.

After completing college, Mrs. Jenkins was employed by the U.S. Navy at Corona, California in the Fleet Missile System Analysis and Evaluation Group. During this period she performed systems analysis for air-launched missile operations. This included data retrieval, data reduction, parameter, and cause/effect studies, and environmental analysis.

HUGO P. POMREHN

Education: M.S.I.E. (O.R.), University of Southern California, Los Angeles
M.S.E., George Washington University, Washington, D.C.
Certificate, Bettis Reactor Engineering School, Pittsburgh, Pennsylvania
B.S., Mechanical Engineering, University of Southern California, Los Angeles

Summary:

Present: Senior Engineer, Bechtel Corporation, Los Angeles

1 Year: Project Scientist, Advanced Technology Division, Holmes & Narver, Inc.

3 Years: Senior Engineer, Bechtel Corporation, Los Angeles

2 Years: Senior Engineer, Holmes & Narver, Inc.

4 Years: Lt., U.S. Navy, U.S. Atomic Energy Commission, Naval Reactors Branch

Experience: Prior to his present position with Bechtel he was Project Scientist engaged in systems analysis activities associated with the Advanced Technology Division, Holmes and Narver, Inc. Principal activities include the study of transportation and logistics systems; systems safety analysis of transportation, nuclear power plant, and biological weapon and weapons transport systems; and the development of technical proposals for various research studies.

Actively engaged in graduate academic work at the University of Southern California in Industrial Engineering with emphasis on Operations Research and Quantitative Business Analysis Options.

While at Bechtel had responsibility for nuclear fuel cycle analysis and evaluation including the preparation of nuclear fuel supply bid specifications, development of various nuclear, processing and economic parameters effecting fuel costs, analysis of fuel cycle costs, and evaluation of the cost analysis results. Additional responsibilities during this period included the performance of mechanical and nuclear analysis tasks associated with the San Onofre and Sacramento Municipal Utility District nuclear power plants, utility system expansion studies, and proposal development for major engineered systems.

During prior employment with Holmes & Narver was engaged in a detailed study of nuclear power reactor operating experience and system performance. Particular emphasis was given to the analysis of the reactor control, safety shutdown, and engineered safeguard systems. Performance of system reliability analyses and operating and safety experience evaluations were required. Safeguard systems studied included emergency core cooling, emergency power generation, and post-incident

containment and decontamination facilities. Five U.S. power reactors incorporating a wide range of control, safety, and engineered safeguard system concepts were investigated.

Prior to participation in the above investigation served as a officer in the U.S. Navy on assignment to the U.S. Atomic Energy Commission, Division of Reactor Development, Naval Reactors Branch. In this connection worked as an engineer in the Reactor Engineering section where particular duties involved the preparation and review of technical specifications used in the procurement of nuclear reactor cores and core components; the review and surveillance of processes used by commercial companies to fabricate, assemble, and ship nuclear reactor fuel and poison materials; and the establishment of acceptance criterion and evaluation of new inspection and fabrication processes to improve component quality and reduce fabrication costs. Performance of these duties required knowledge of the nuclear, thermal, mechanical, and metallurgical design of nuclear reactors. Specialized training received during this period included six months of academic work at the Bettis Reactor Engineering School and training programs associated with naval reactor prototype testing and nuclear submarine construction.

Professional Affiliations:

American Society of Mechanical Engineers, American Nuclear Society, Pi Tau Sigma, Tau Beta Pi
Registered Mechanical Engineer, State of California

EXPERIENCE

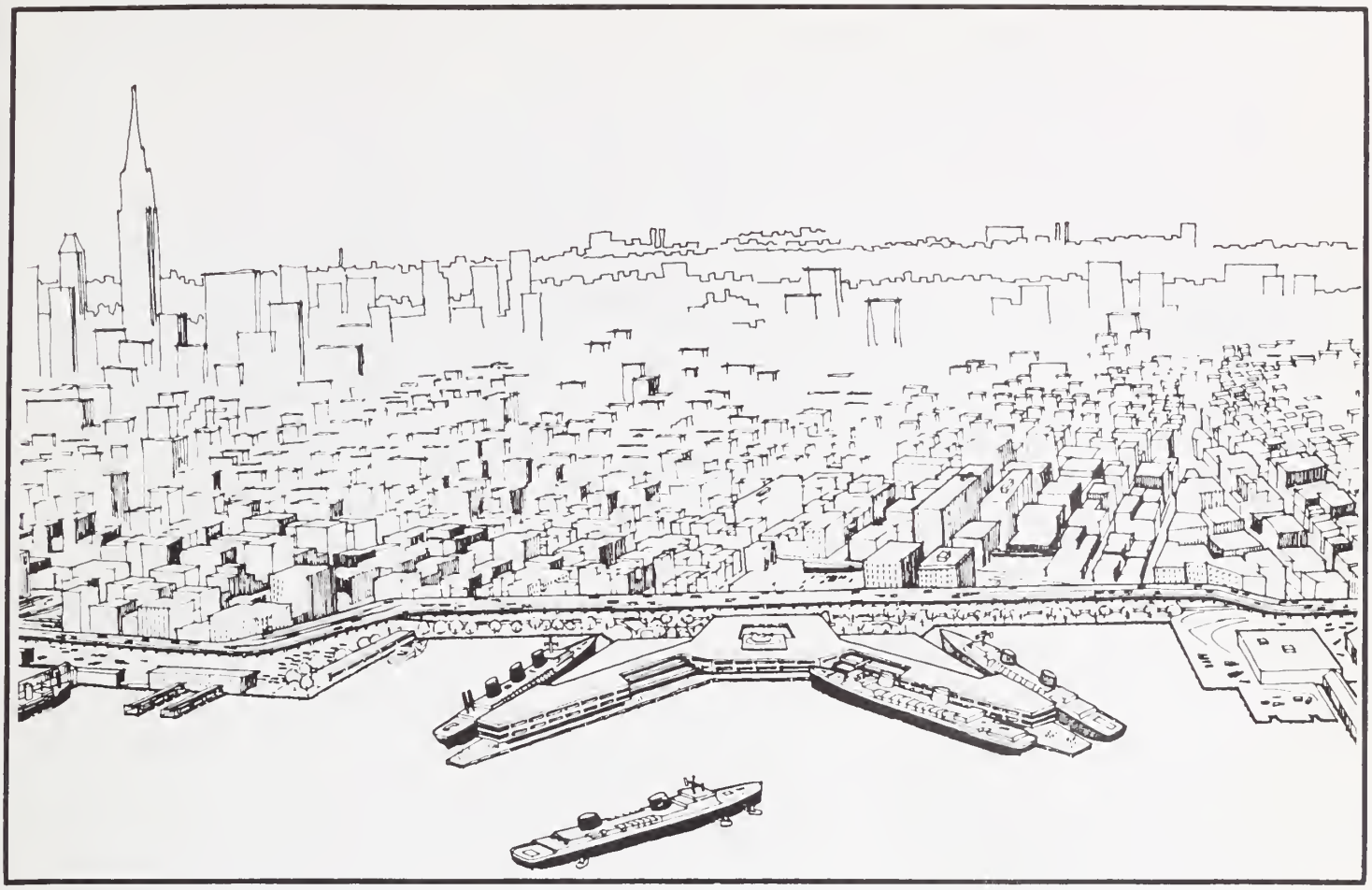
BECHTEL'S MARINE EXPERIENCE

Thirty years of experience in the development of port and harbor facilities enables Bechtel Engineers to proficiently plan, design, construct, and operate a wide variety of marine installations. Engineering specialties include capabilities in marine structures, marine terminals, harbor facilities, vessel moorings, containerized cargo handling, bulk cargo terminals, shipyards, and marine transportation.

In the master planning of ports and harbors, Bechtel combines the expertise of its large planning staff with the specialized knowledge of its marine engineers, integrating the needs of both marine and land facilities on a regional basis. Industrial parts are often included and integrated with the port and other transportation media.

Several recent Bechtel projects encompass the preliminary design of new marine terminals, the modernization of existing facilities, and a large marine passenger terminal at one of our major cities. Many of Bechtel's larger industrial projects have called for the development of new port facilities to service an industrial plant.

Starting with the World War II shipyards, Bechtel has served clients in the shipbuilding industry for over 30 years. Recent clients included the Lockheed Shipbuilding and Construction Company, Todd Shipyards, and Bath Iron Works. Bechtel's efforts have included major roles in the conceptual studies and proposals for the ultra-modern FDL and DX shipyard concepts.

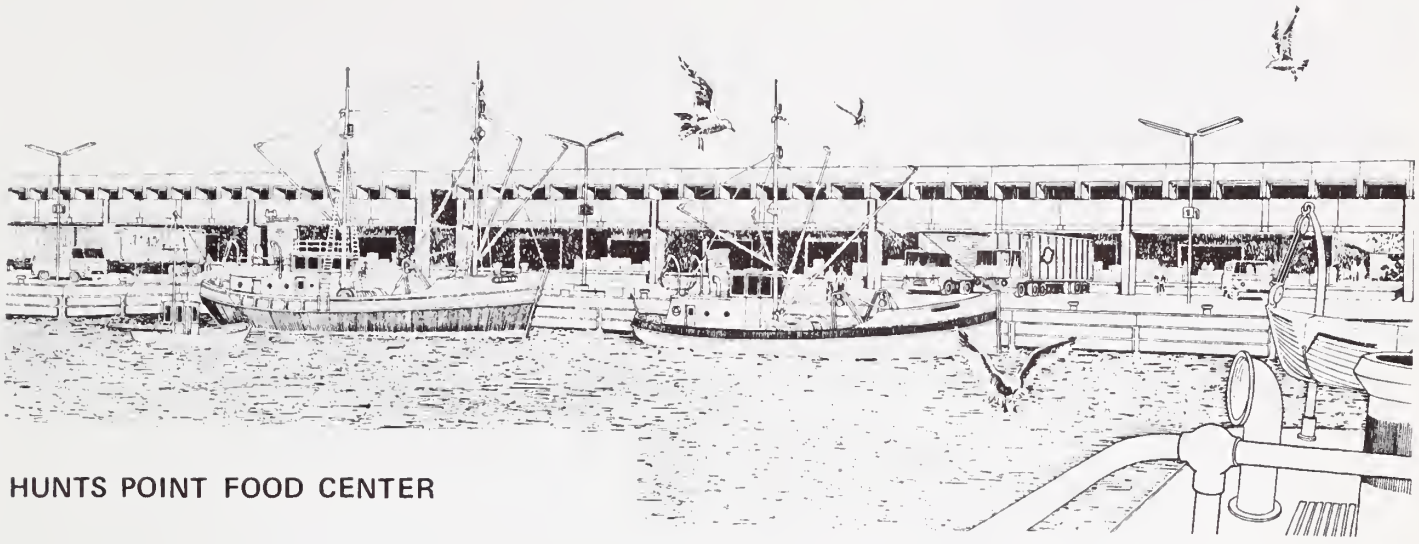


MARINE PASSENGER TERMINAL - NEW YORK CITY

For the United States Lines Company, Bechtel performed a conceptual study of a Marine Terminal proposed for New York City.

The terminal would provide berthing facilities capable of accommodating superliners ranging from 900 to 1050 feet in length. An overall complex beginning with the terminal would subsequently be developed in stages to include hotels, office building, retail stores, residential units, and a convention center.

The optimum method of satisfying the need for new passenger facilities is to create an efficiently planned and centralized marine terminal for several shipping lines at a convenient location.

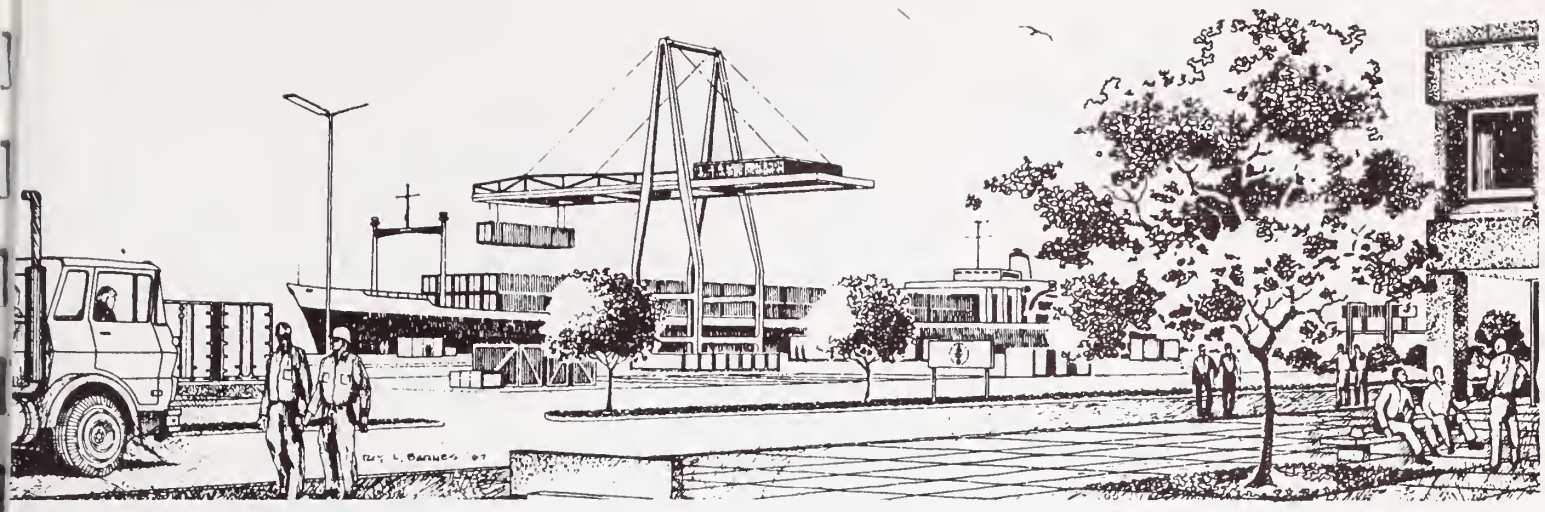


HUNTS POINT FOOD CENTER

Progress in food processing and distribution methods has made most of the existing food markets in New York city practically obsolete. Bechtel has been commissioned to prepare a master plan for relocating the markets at Hunts Point, located in the Bronx at the confluence of the Bronx and East Rivers, where deep water terminals could be integrated into the overall plan.

The main objective of the master plan is to provide the most beneficial utilization of the available land and provide a plan for orderly expansion of the markets. The plan also involved developing the environmental factors including architecture, landscaping, and industrial development. Schedules for land development were prepared as well as the estimated cost of development. The estimated fully-developed cost (not including financing charges or escalation) is $156 million dollars. Land costs were $20 million, land development $15 million, and building and parcel development $121 million.

Bechtel is currently performing engineering/ management services for the first phase of land development, estimated at $7.7 million. Bechtel may also participate at A/E or AE manager for building and parcel development by lessees.

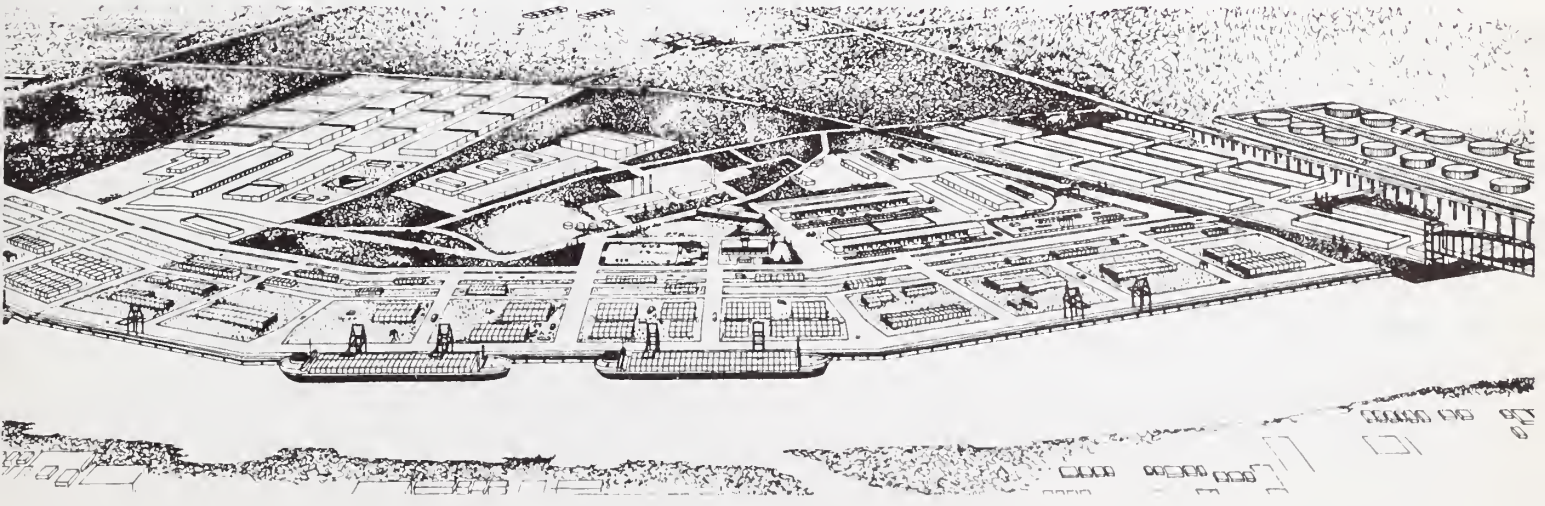


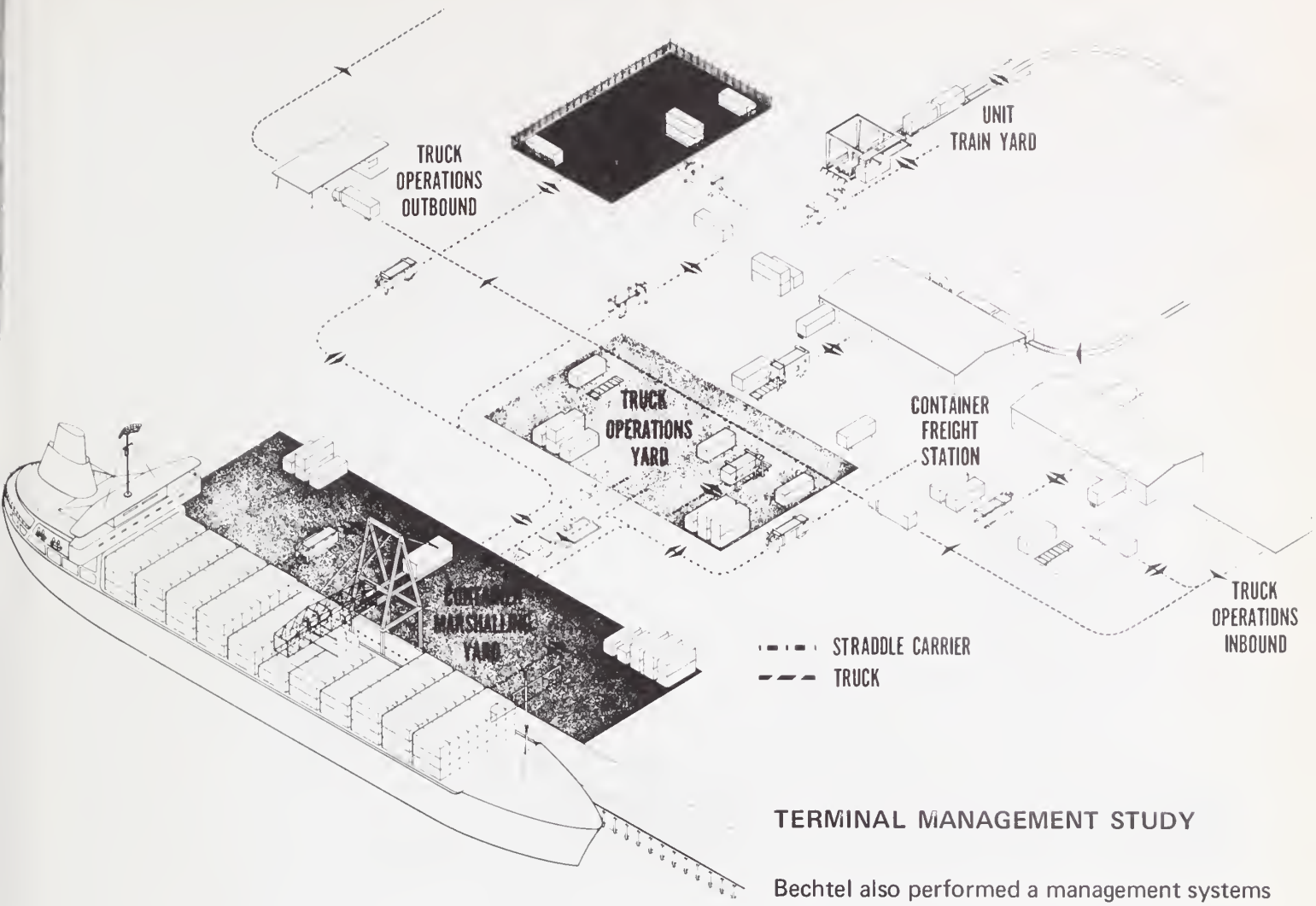
HOWLAND HOOK CONTAINERSHIP TERMINAL — STATEN ISLAND

This proposed Containership Terminal was the result of an engineering and economic feasibility study conducted for American Export Isbrandtsen Lines, Inc., and is, in essence, a hotel for cargo ships. The recommended terminal requires development of approximately 300 acres of land and about a mile of waterfront.

Berthing facilities for simultaneous loading and unloading of five super-containerships of the future and support facilities for servicing the containers are provided.

The cargo handling capabilities of the terminal are greater than that presently projected for the entire Port of New York for the life of the terminal.





CONTAINERSHIP TERMINAL

Intricate flow diagrams were prepared for the Containership Terminal to illustrate the integration of truck, train, and ship traffic. The diagrams took into consideration the delivery of partial loads and transient freight, as well as the basic function – receipt and delivery of full containers. To accomplish the most efficient flow patterns, the terminal was divided into yards, each containing a particular element in the movement of freight.

The terminal was also provided with a computer to monitor all inbound and outbound containers, program the loading of containerships, store information relative to each container, and identify consignees.

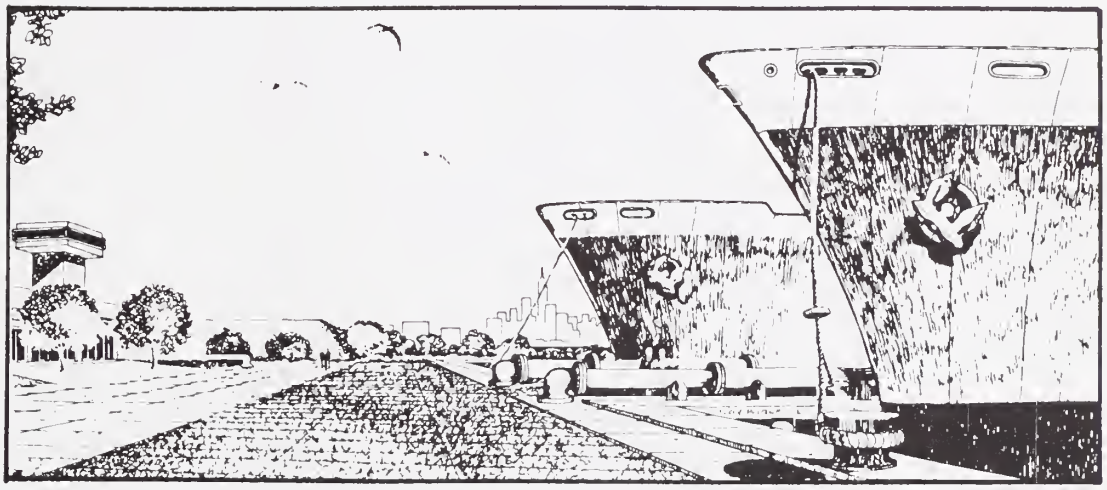
TERMINAL MANAGEMENT STUDY

Bechtel also performed a management systems study for the containership terminal to:

- Establish the operating organization, including detailed organization chart with complete personnel requirements
- Establish operating procedures for handling inbound and outbound cargo by all transportation modes
- Establish supervision and computer control system and procedures
- Establish tariff structure for all terminal services
- Analyze cash flow over a 20-year period of revenues, operating and financing cost on both public and private ownership basis to establish most advantageous ownership

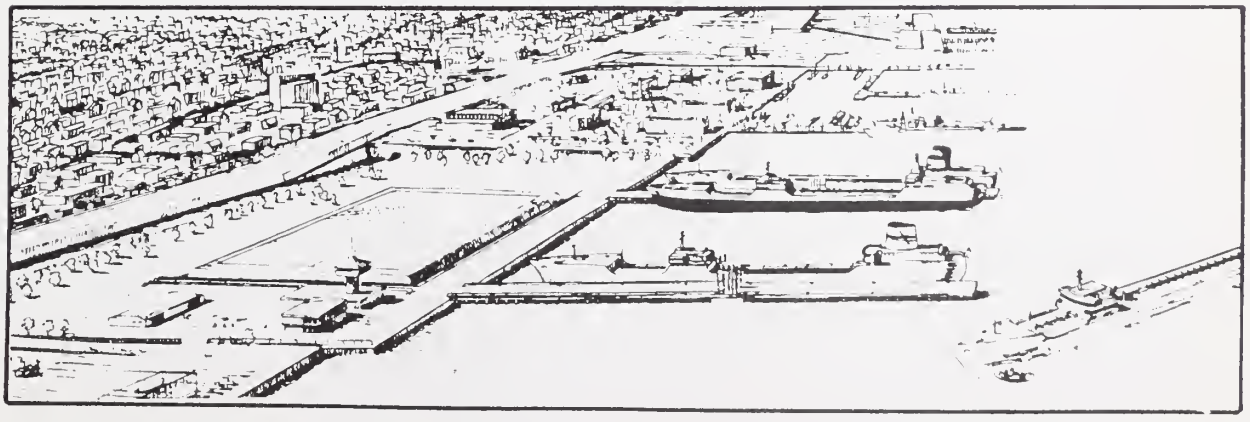
STAPLETON OIL TERMINAL – Staten Island

Bechtel performed an engineering and economic feasibility study for American Export Isbrandtsen Lines, Inc., for a proposed oil terminal capable of receiving tankers in the 60,000 to 80,000 dwt range on Staten Island in the Port of New York. The facility would handle the full range of crude oils and petroleum products, including heavy oils and white products. Volumes of oil up to 40 million tons annually could be handled.



The proposed terminal consists of a marine terminal in Stapleton and a distribution center in Howland Hook. Four 48-inch pipelines link the distribution center a distance of approximately seven miles.

Facilities for simultaneous unloading of four tankers are provided at Stapleton. Tanker pumps are used to unload cargo into any one of four distribution pipelines sized so that tankers can pump their cargoes directly to the distribution center without the need of intermediate pumping stations.



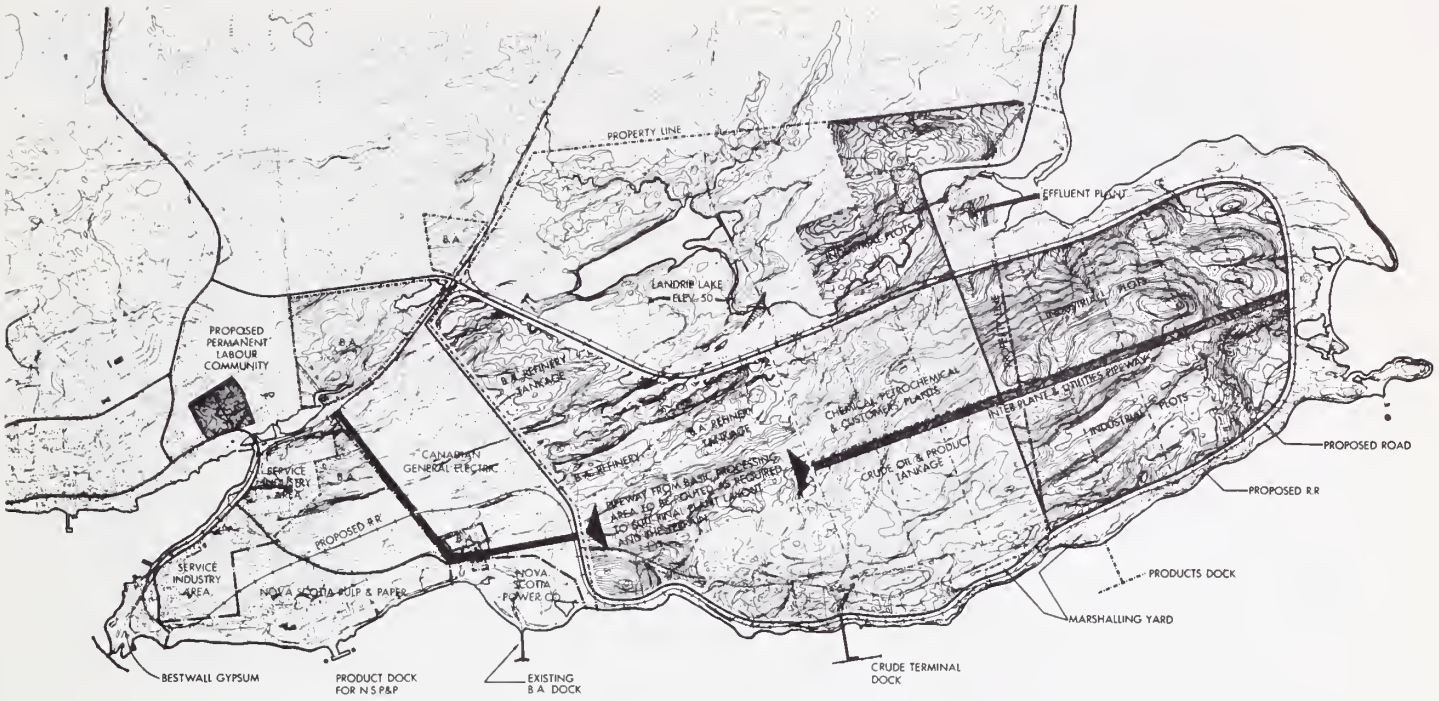
NEW ORLEANS SELECTS BECHTEL FOR PORT MASTER PLAN

Bechtel was selected by the Board of Commissioners to create a Master Plan for the Long-Range Development of the port over the next 25 years. The initial phases of the program have begun. The first phase analyzes the existing conditions in the port, reports on the technological trends in cargo transportation, and project future demands for port service. The second phase deals with cargo handling facilities. Terminals covered in this phase include: containership, break-bulk and special cargo, inland and intra-costal cargo collection, grain, dry-bulk, and bulk liquid. Bechtel engineers will also determine the industrial development potential during the study. The Master Development Plan will have as units: a general land use plan, a port facilities plan, an intermodal transportation plan, and a phasing plan. A thorough financial analysis will be conducted and will include development costs, operating costs, revenues, and economic feasibility. The plan will also recommend the optimum commercial, residential and recreational uses of the City waterfront now occupied by obsolete port facilities.

INDUSTRIAL SEAPORT STUDY – MIAMI, FLORIDA

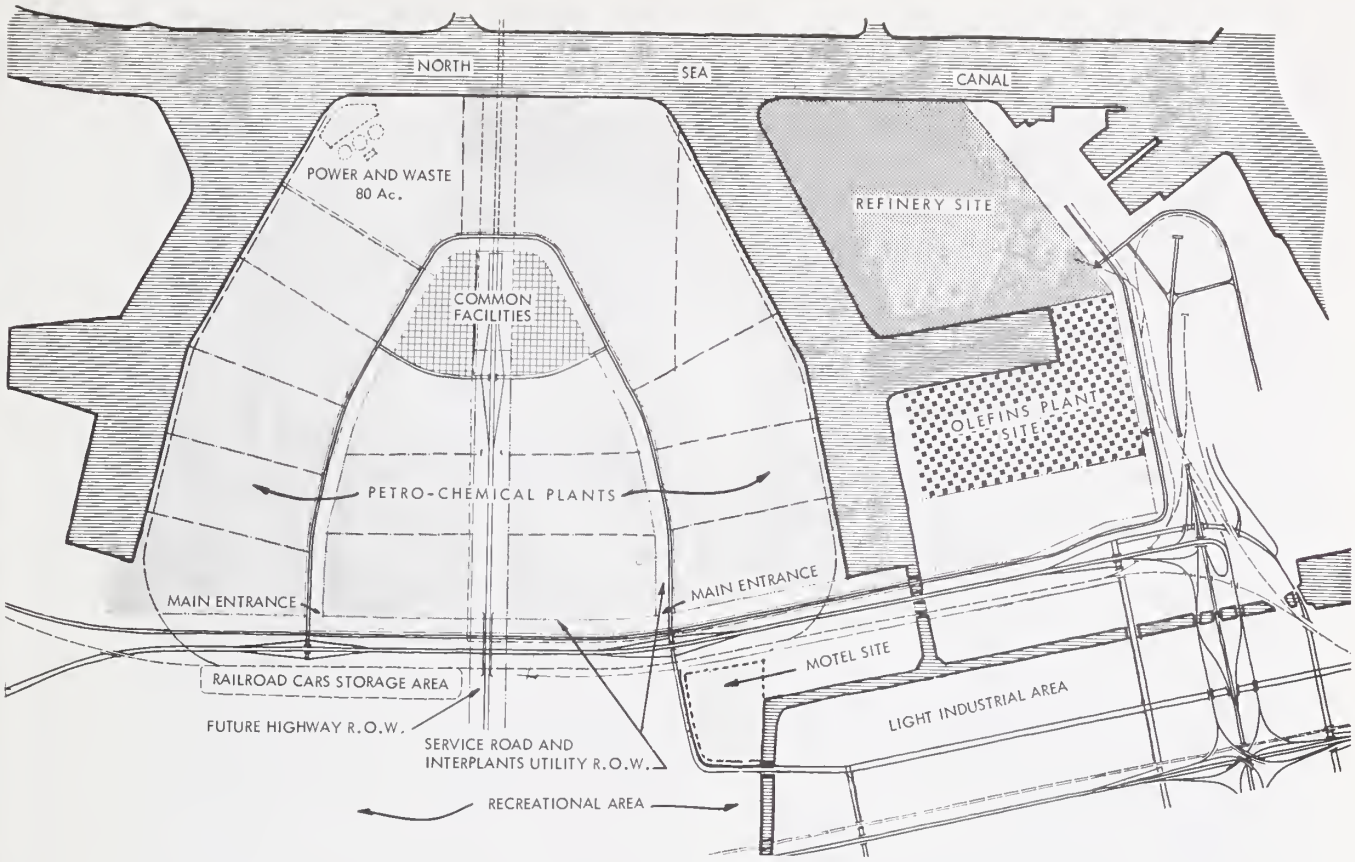
Bechtel conducted a feasibility study for the development of an industrial seaport and industrial park complex in Dade County, Florida. The scope of this study included:

- Market analysis and determination of development potential and program for a phased 20-year development period.
- Site evaluation and selection of optimum site compatible with social, economic, and engineering considerations.
- Conceptual design, land use, and circulation plan for a complete port occupying 1180 acres and containing break-bulk general cargo terminals, containership terminals, bulk solids and bulk liquids terminals, and administrative and support facilities, all to be constructed in conjunction with a 1000 acre industrial park that will accommodate a broad spectrum of interrelated manufacturing, process, and oceanographic industries.
- Development of investment cost and revenue schedules and financial analysis to determine overall economic feasibility of the project.



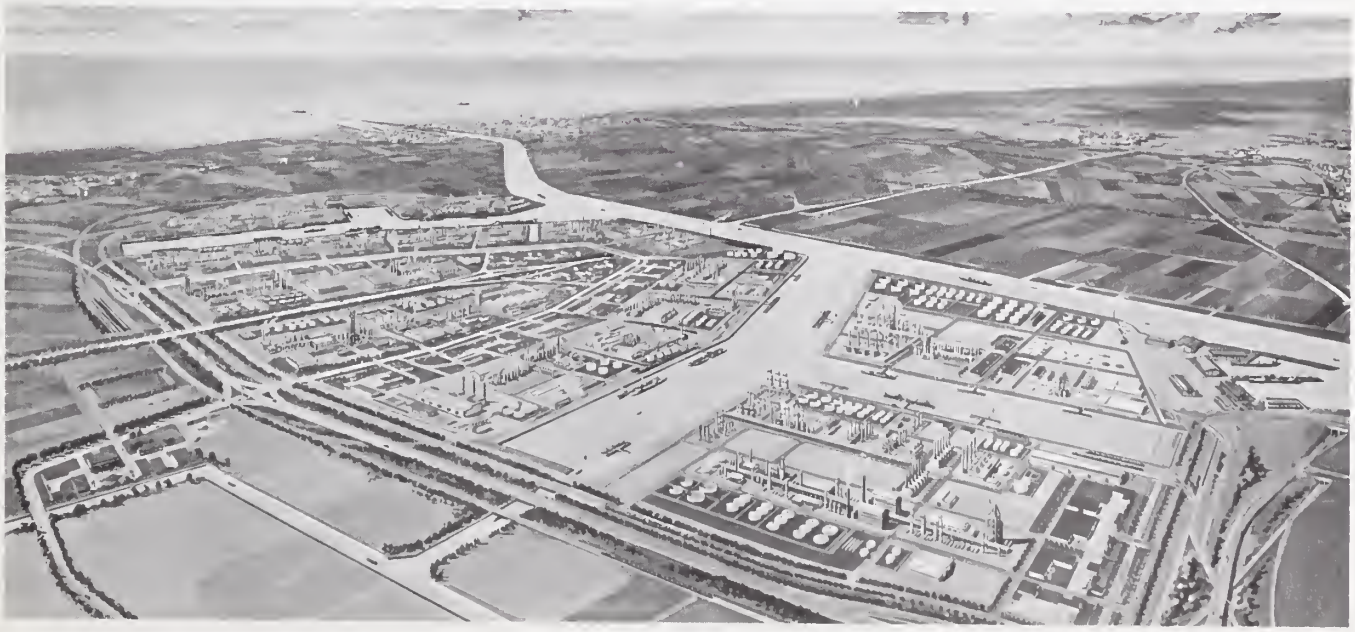
MASTER PLAN FOR POINT TUPPER, NOVA SCOTIA

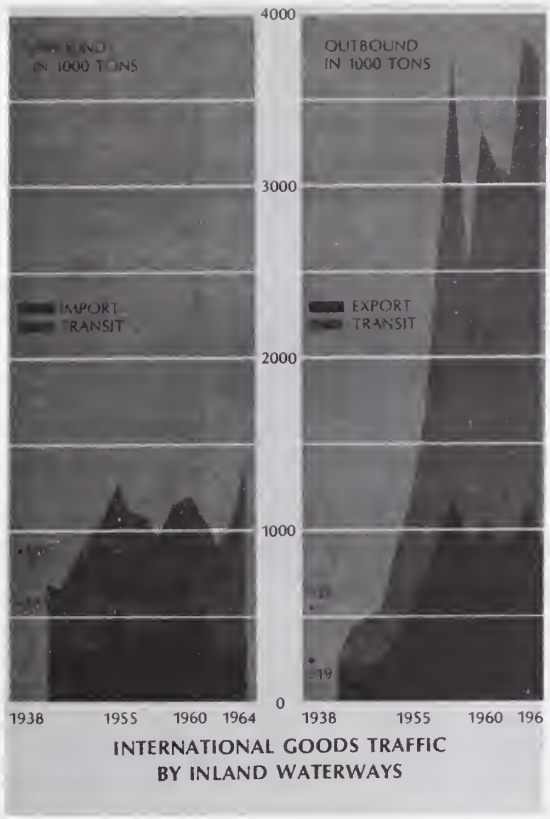
Bechtel planners and engineers worked with the British American Oil Company to prepare a master plan for development of oil terminals, refineries, and petrochemical plants in this area. They established a program for the collection and analysis of data and created a preliminary plan for the industrial complex and community. The initial survey investigated the area for industrial development, with emphasis on significant features of terrain; the problems on site improvement, metheorological data; availability of water; shipping via ocean freight; railways, highways, and airways, and transportation by public systems. Later surveys considered the area's social environment, economic structure, labor rates and availability, and other factors.



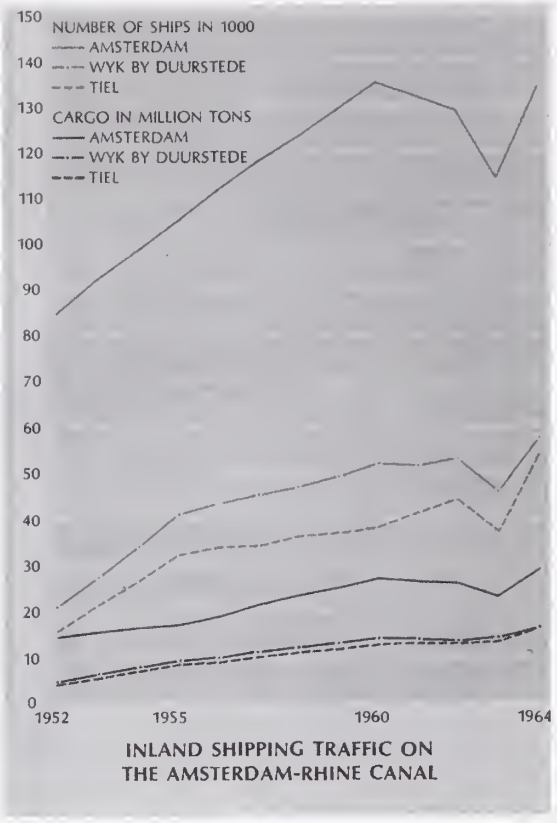
PETROCHEMICAL CENTER — AMSTERDAM, NETHERLANDS

A recently prepared master plan covers a 3700-acre industrial center in the heart of Europe. Chemical plants in the complex will process raw materials from a large oil refinery and associated olefins plant. The center features integrated support facilities for utilities, roads, parking, fire protection, shipping and receiving, maintenance, waste treatment and disposal, and employee service facilities and amenities. Bechtel's studies for this plan included a survey of the entire economic and social pattern of Western Europe, including urbanization, projected population, employment, and land use trends, transportation, and government policies affecting the chemical industry.





INTERNATIONAL GOODS TRAFFIC
BY INLAND WATERWAYS



INLAND SHIPPING TRAFFIC ON
THE AMSTERDAM-RHINE CANAL

EUROPEAN INDUSTRIAL EXPANSION STUDY

These graphs are typical of the data that Bechtel's systems engineers gathered, reduced to a usable form, and then correlated for a major European client. Other types of data that were gathered and correlated into significant patterns include geology, meteorology, population trends, residential patterns and trends, transportation system interfaces, cargo volumes and types, foreign trade factors, production indices for specific industries, tax factors and trends, and wage rates.

MARINE COMMUNITY ON GRAND BAHAMA ISLAND

The shoreline of the Carribean is the setting for a plush waterfront community located near Freeport, Grand Bahama Island, on a site that once was tropical jungle. To take maximum advantage of the clear, mild Caribbean waters, a lagoon to the sea was conceived as the major design element. Around the lagoon, homesites of generous size are situated. The lagoon's graceful shape reflects a careful balance between achieving maximum efficiency and maintaining the site's natural character. Its free-flowing lines represent a radical departure from the angled and regimented design of most marina communities. On the seashore of white sand are a hotel, apartments, restaurant, and yacht docking facilities. Bechtel saw this project through to completion with responsibilities continuing from planning into engineering and construction management.

CROCKER HILLS, NEAR SAN FRANCISCO, CALIFORNIA

Within a 15-minute drive from downtown San Francisco lies San Bruno Mountain commanding panoramic views of San Francisco, the Pacific Ocean, and the Bay Area. Upon this 2700-acre site will be constructed a complete new community for 20,000 persons under the guidance of a master plan and development program prepared by Bechtel. Working with the site's natural characteristics, the plan is designed to overcome severe problems including underlying rock formations, steep topography, and complex wind and fog conditions. By locating structures and roads according to the natural terrain, a minimum of earth moving is assured and significant economic and aesthetic benefits thereby achieved. Nearly half the mountain's area will remain as open space. The remainder will be developed as townhouses, cascade apartments, high-rise dwellings, a golf course, schools, parks, churches and a town center containing shopping and public facilities.

OLIN MATHIESON CHEMICALS GROUP'S SITE PLAN

Bechtel was selected to conduct an intensive investigation of Olin Mathieson's Chemical Group's site. Concurrent with background research was the development of personnel and building programs for the master plan. A survey of the Olin Mathieson Chemicals Group's present and future requirements was made, and a total population projected. Functional requirements of personnel were then analyzed, and basic standards for offices, laboratories, and support areas were developed.

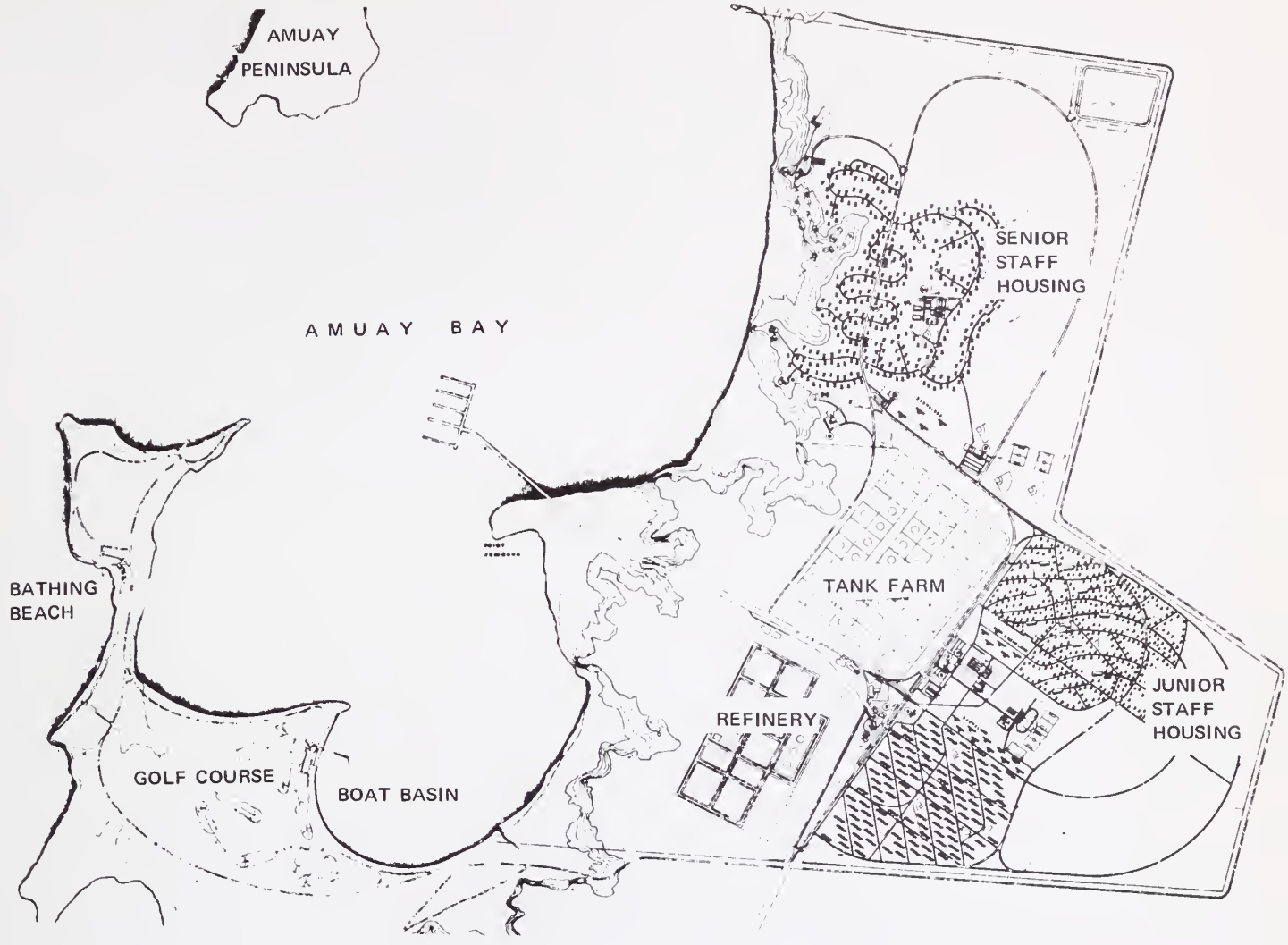
The office and research buildings are located in the center of the site and house a majority of the site's population. The office building, situated on a small plateau, becomes the center of gravity for site activities.

The research building is set in a vale, providing some seclusion, a desirable environment for this type of function. North of the research building is a cluster of development laboratories that will support research functions. Activities of the labs will be localized in the central service area.

Construction of the 226,000 square foot office building has begun. A development plan for future expansion has projected a research center of over 280,000 square feet, with a total of 610,000 square feet of buildings.

NORTHERN NEW JERSEY MEADOWS

The words "most valuable piece of unused real estate on earth" are often used to describe the Northern New Jersey Meadows, 47 square miles of tidal marshland concentrated along the Hackensack River, a 20 minute drive from Times Square. Today, the State of New Jersey, 5 counties, 30 municipalities, and numerous Federal agencies and special districts share jurisdiction over the Meadows. Bechtel was engaged by a special Commission created by the New Jersey State Legislature to evaluate the multitude of planning efforts under way and propose a framework for a comprehensive Meadows development plan and program. The prime recommendation made to the Commission was to establish an agency at the State level, with adequate legal, administrative, and financial means for implementing a plan.



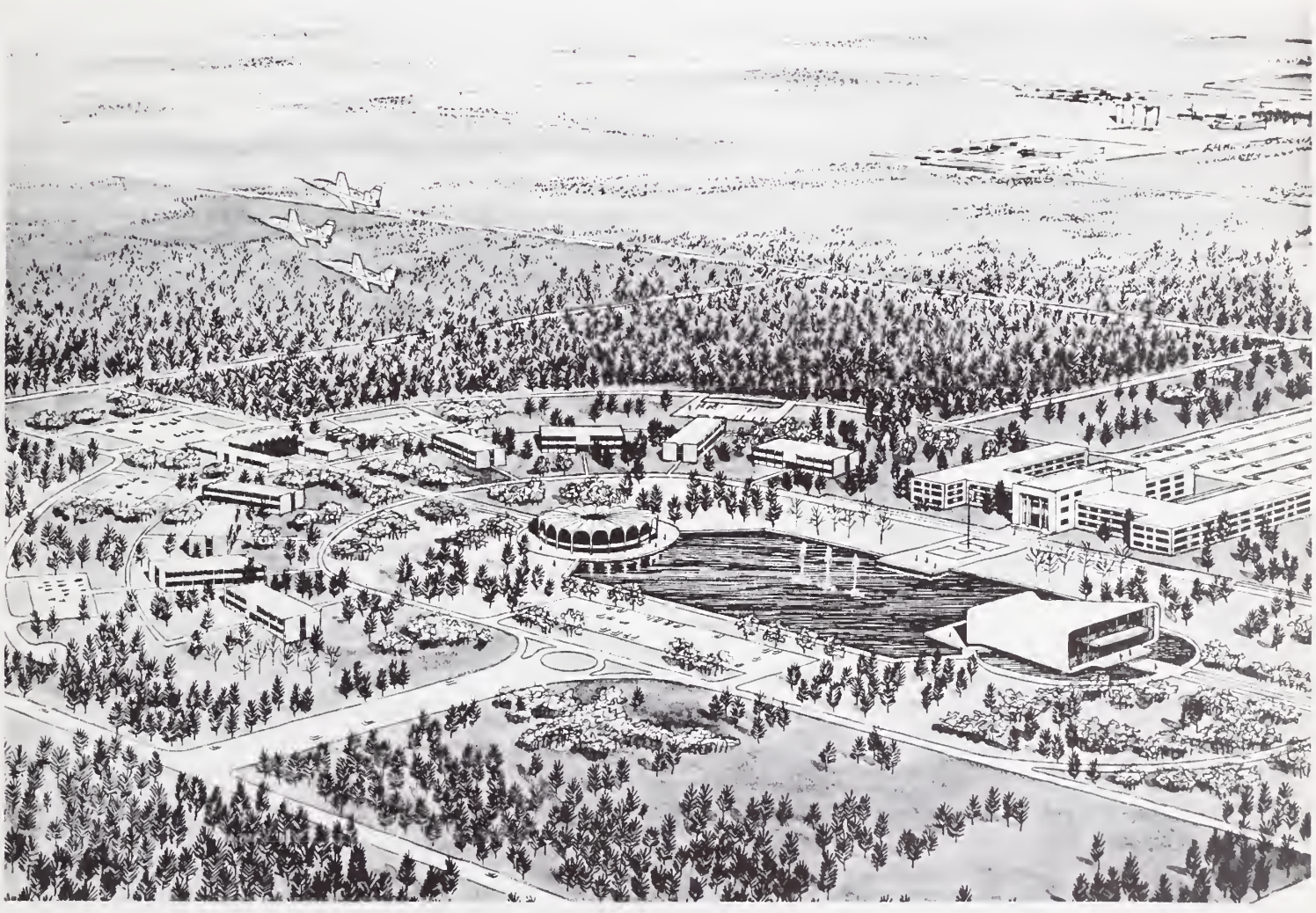
A COMPLETE TOWN IN VENEZUELA

Employees of Creole Petroleum Corporation's refinery and their families now live in a new town designed by Bechtel. The 6000 acre site is located on Amuay Bay on Venezuela's Paraguana Peninsula about 250 miles northwest of Caracas. Judibana was planned for an initial population of 8600 persons. Three neighborhoods were designed each with a variety of housing types from two-story apartment-like structures for bachelors, to row housing, to detached, single-family homes.

The town contains all facilities and structures needed to satisfy the residents' daily living, working, and recreational needs and reflects thorough consideration of Venezuelan culture and customs. Social functions and recreation were emphasized by the provision of a wide range of facilities including parks, playing fields, clubs, stadium and golf course. The town's social life revolves around a community center containing an auditorium, restaurant, market, shops, school, church, bus depot, and administrative offices. Provision for town expansion was made in the allocation of land and even in the design of individual buildings.

ARNOLD ENGINEERING DEVELOPMENT CENTER –
TULLAHOMA, TENNESSEE

This project comprised siting studies and a long range land utilization study in the Military Construction Program FY 1966-70. A study of land utilization of the military reservation was made to identify those areas required by proposed facilities and long range plans. In the foreground of the rendering is the Central Engineering Complex, integrating eight new engineering buildings, an auditorium, a technical library, and a commisary with the existing administration building.



BANDAR ABBAS REGIONAL DEVELOPMENT PROJECT

Bechtel Corporation is responsible for the overall management direction, technical coordination, and integration of the separate program elements for the Iran Development Consortium. This is a group of American companies that was selected by the Government of Iran to plan and program the comprehensive economic and social development of the Bandar Abbas region . . . a sparsely populated area of 49,500 square miles in Southern Iran. The overall goal of the Consortium includes four distinct tasks:

- Completely inventory all resources, both human and natural
- Formulate specific development programs for agriculture, fisheries, water development, desalting, minerals, shipyards and heavy industry, energy and power, communities development, transportation, communications, and tourism
- Evaluate the combined programs, using techniques such as linear programming to optimize the allocation of resources, determine priority of projects with regard to the regional economic impact, and develop a master schedule for the phasing of the separate programs
- Implement the comprehensive development plan

Bechtel is responsible for the tasks involving communications, communities development, tourism, mineral resources, transportation, and water development. The other tasks have been apportioned among the other members of the Consortium, Bethlehem Steel Corporation, FMC Corporation, and Westinghouse Electric Corporation.

SAMUEL MERRITT HOSPITAL MASTER PLAN, OAKLAND, CALIFORNIA

Future requirements for this major hospital were projected through 1985 on the basis of changing population patterns, transportation accessibility, incremental growth, and economic feasibility. The plan provides new quarters for student nurses, classrooms, medical research library, auditorium, expansion of existing service facilities (including cafeteria and food preparation areas) and a three-level parking structure. These developments were coordinated with a master plan for the surrounding area prepared by the City of Oakland, California.

ENVIRONMENTAL PLANNING CREATES CALABASAS PARK

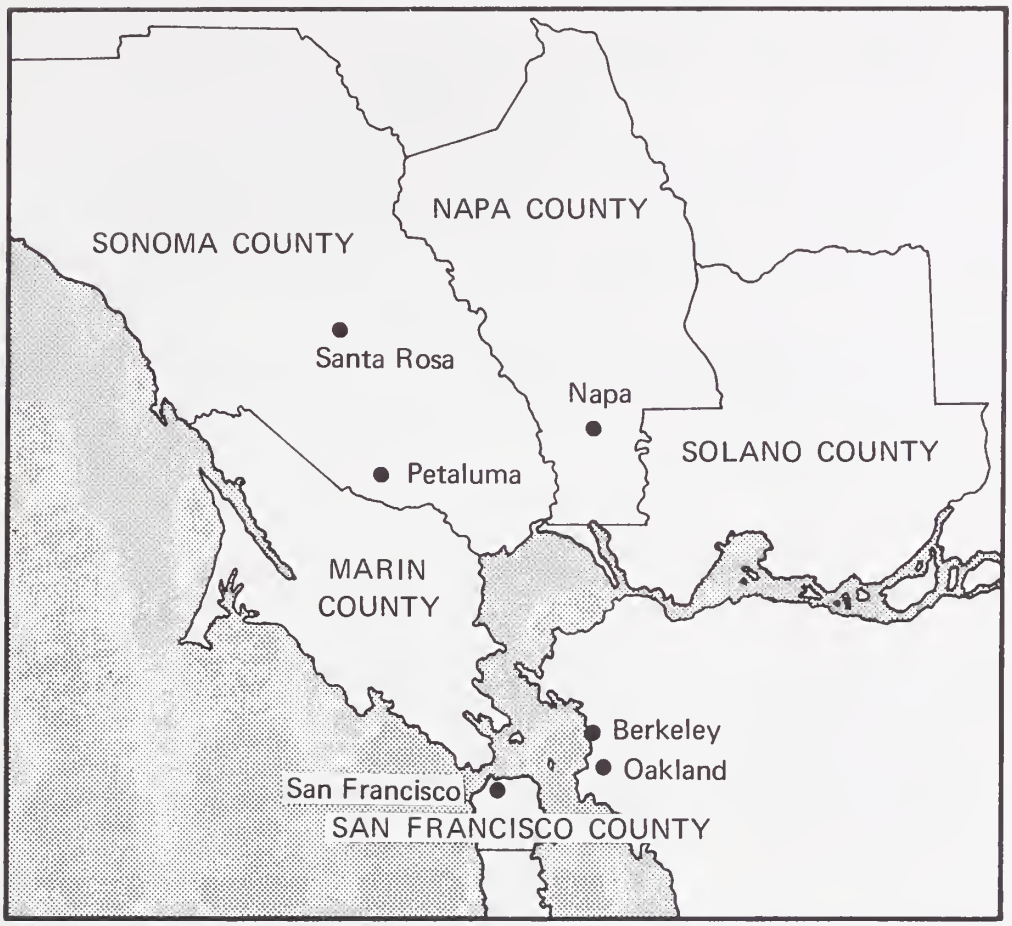
Here in rolling hills and quiet valleys – where cinema heroes and heroines performed before the cameras of "National Velvet," "Stalag 17," "Robin Hood" and scores of other motion pictures for a quarter of a century – will soon rise 4000 luxury homes, a regional shopping center, an exclusive restaurant, schools, and a plush golf course and country club. It will be the newest of Bechtel's total environment communities" – Calabasas Park.

Bechtel has master planning and full management responsibilities for creating the new, 3000-acre community for an expected 15,000 people near the town of Calabasas, about 20 miles north of Los Angeles.

Calabasas Park, an area of low hills, secluded valleys, small lakes, streams, and thousands of stately oaks, was purchased from Warner Brothers Studios in 1959 by Associated Southern Investment Company, an affiliate of Southern California Edison Company.

WESTLAKE VILLAGE,
NEAR LOS ANGELES, CALIFORNIA

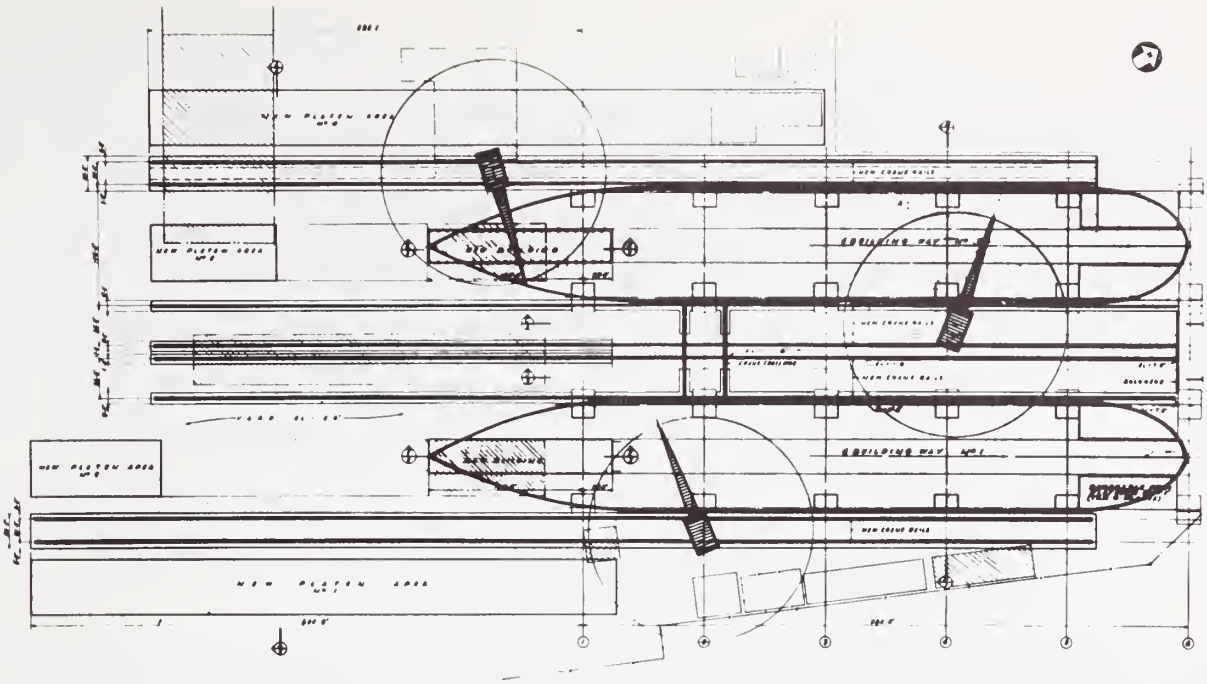
By 1980, the 12,000-acre Albertson Ranch, one of the majestic cattle ranches which once surrounded the Los Angeles Basin, will be transformed into Westlake Village—a bustling new community of 70,000 people. Bechtel designed and produced a complete community containing facilities for all everyday human activities. The Master Plan allocates land for a wide range of dwelling types and styles in a setting of lakes, parks, and village greens embellishing the natural beauty of the site. Schools, churches, recreational, cultural facilities, stores, business and professional offices, and industrial sites combine to form a balanced "new city in the country."



UNIVERSITY OF CALIFORNIA — SITE SELECTION STUDY

Enrollment at the University of California, the nation's foremost publicly supported educational system, will grow from its present 80,000 students to nearly 275,000 by the year 2000. Bechtel was selected by the Regents of the University to begin implementation of a Master Plan.

Bechtel's services to the Regents comprise a comprehensive analysis of the entire San Francisco-North Bay region. Population within the region and enrollment in the entire University system and pertinent state and private colleges, will be analyzed to the year 2000, while precise criteria will be developed for each of the two campuses. Potential sites will be analyzed in terms of regional accessibility, existing and proposed regional and local land use patterns and physical and economic factors related to site development and construction. In addition, Bechtel will evaluate the economic impact of the University upon the communities, particularly in terms of assessed valuation and employment.



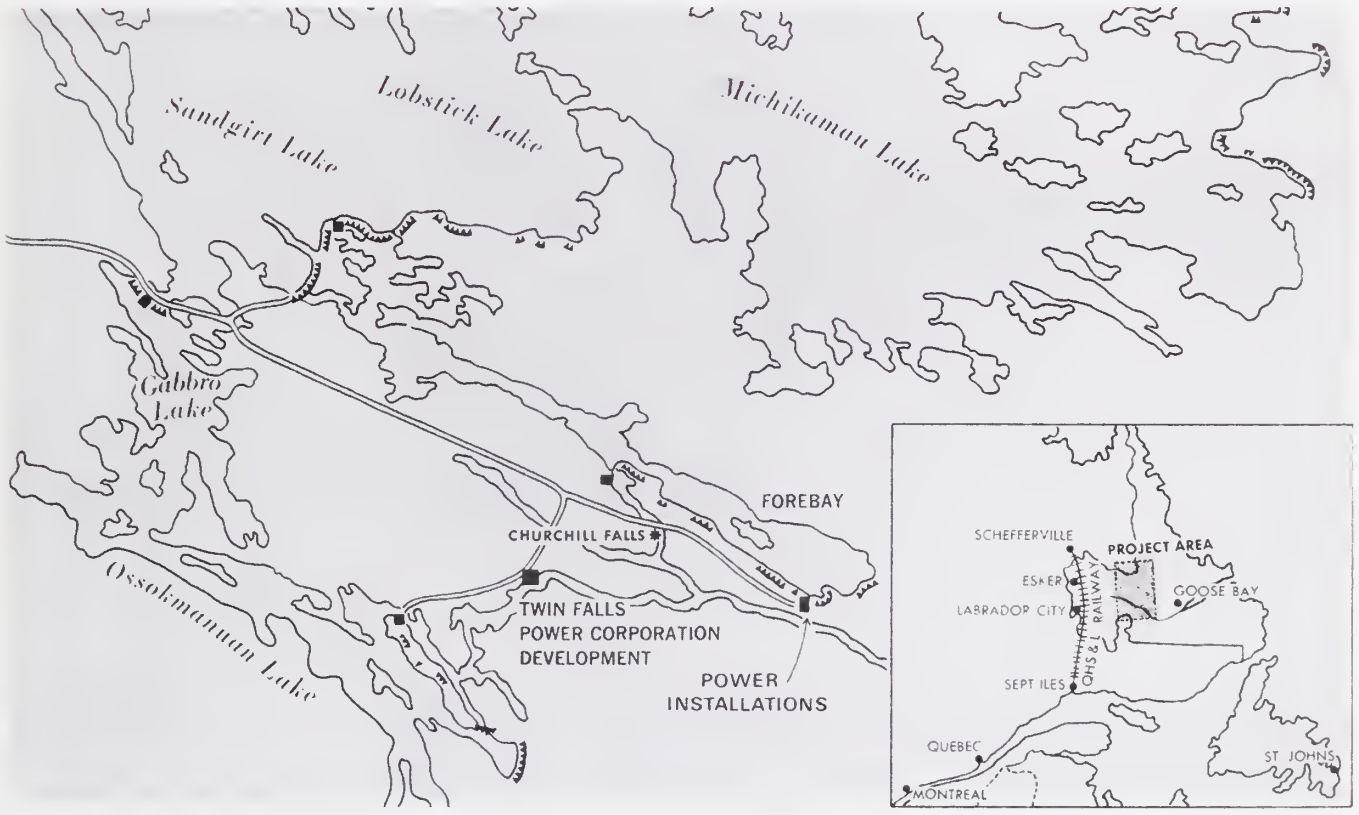
TODD SHIPYARD MODIFICATION

Bechtel developed 12 conceptual design schemes, complete with cost estimates, for the Modification to Todd Shipyard's San Pedro, California facility for the erection of a series of large containerships. The scheme chosen for implementation encompassed major renovations to the launch ways, cranes, and attendant fabrication facilities. The installation incorporates the most modern technology at an optimum cost within the restraints of an existing operating shipyard.

SYSTEMS ANALYSIS STUDIES

In the course of numerous important and complex projects, the Bechtel staff has performed a large number of systems analysis studies with the purpose of optimizing technical and economic performance of large-scale systems and selecting the best concepts and designs. The range of subjects studied has been wide and varied: optimization of production cycles, selection of process units, construction scheduling, optimization of transportation networks, missile defense evaluation, community planning, and many other problems. Our staff is well versed in the application of modern methods of systems analysis . . . mathematical modeling, linear programming, CPM, PERT, forecasting and simulation techniques. In many instances where the problem was characterized by a large number of alternatives and parameters, computer solutions have been sought, using the services of the Bechtel Computer Department.

Among more recently completed systems studied are the following examples.



- A billion dollar hydroelectric construction project at Churchill Falls, Labrador, required a careful evaluation and precise scheduling of procurement, transportation, and delivery for several thousand items of equipment and materials. The problem was analyzed and translated into a computer program to give optimum timing, transportation means (rail, water, highway, air), and cost for the various procurement items. The study ensured the absence of costly delays in the construction schedule and has materially reduced procurement costs. The program is being kept up to date and serves as an effective controller of inspection, expediting, and delivery schedules.

- Several large scale programs of land development and new community planning necessitated a system analysis approach to evaluate alternate development strategies and program adjustments. Characteristic among these programs are the new communities of Calabasas Park (2800 acres, for 15,000 people) and marine-oriented Catalina Island (10,000 people). A computerized economic model was conceived and used to optimize return-on-investment by rescheduling various phases and elements in the development programs. The model has also been used profitably as a control device for actual work on the projects through quarterly updating to reflect adjustments in physical plan, construction costs, revenues, and land absorption rates.

- Power plant systems, both conventional and nuclear, are optimized by a number of systems analysis programs as a standard part of the design process. These programs are extremely complex in the amount of technical details and interrelationships involved. Their use results in the proper selection of thermodynamic cycle and equipment sizes giving the best efficiency coupled to an optimum economic performance. More recently, these programs have been applied to the 450 megawatt nuclear power station at San Onofre, and the 1500 megawatt steam power stations at Four Corners, Mojave, and Ormond Beach.

- Regional power transmission and substation systems are analyzed and designed on the basis of a sink-source network program incorporating sizing, routing, and cost parameters. Thousands of miles of transmission lines are laid out according to the most economic alternative among the many possible routes.

RECORD OF PAST PERFORMANCE

As an illustration of the outstanding record of Bechtel performance with respect to management, work quality, costs, and performance schedule, a review of the large list of clients served by Bechtel, both in the United States and abroad, reveals that a large percentage of these clients have demonstrated their satisfaction by selecting Bechtel for numerous additional projects. This has been particularly true of large projects, unconventional in nature and involving advanced concepts of design.

REPRESENTATIVE BECHTEL CLIENTS

In the United States and Canada

Air Reduction Company, Inc.
The Alberta Gas Trunk Line Company Limited
Alberta Natural Gas Company
Alberta Phoenix Tube & Pipe Limited
The Algoma Steel Corporation Limited
Allied Chemical Corporation
American Cement Company
American Electric Power Company
American-Hawaiian Steamship Company
American Metal Climax, Inc.
American Potash & Chemical Corporation
American Smelting and Refining Company
American Sugar Refining Company
Arizona Public Service Company
Arkansas Power and Light Company
Asbestos Corporation Limited
Atlantic City Electric Company
Atlantic Sugar Refineries Limited
Avisun Corporation
Bay Area Rapid Transit District
Bethlehem Pacific Coast Steel Corporation
Boeing Company
British American Oil Company, Limited
British Newfoundland Company
Caland Ore Company Limited
California State Department of Water Resources
Camrose Tubes Limited
Canadian General Electric Company Limited
Canadian Industries Limited
Canadian Oil Companies Limited
Canadian Petrofina, Ltd.
Chevron Chemical Company
Cities of Colorado Springs and Aurora, Colorado
City and County of San Francisco, California
Cleveland-Cliffs Iron Company
Colonial Pipeline Company
Colony Development Company
Commonwealth Edison Company
Consumers Power Company
Continental Can Company, Inc.
Continental Oil Company
Copper Range Company
Crocker Land Company
Delaware Power & Light Company
Department of Lighting, Seattle, Washington
Detroit Edison Company
Dominion Foundries and Steel, Limited
Dominion Steel & Coal Co., Limited
Douglas Aircraft Company, Inc.
Douglas County Public Utility District No. 1
The Dow Chemical Company
East Bay Municipal Utility District, California
Esso Research & Engineering Company
Fibreboard Paper Products Corporation
The Firestone Tire & Rubber Company
Florida Power & Light Company
FMC Corporation
General Electric Company
General Foods Corporation
Great Canadian Oil Sands, Ltd.
Gulf Oil Corporation
The Hanna Mining Company
Hawaiian Commercial & Sugar Company, Ltd.
The Hawaiian Electric Company, Inc.
Hercules Powder Company
Hilo Electric Light Company, Ldt.
Humble Oil & Refining Company
Idaho Power Company
Imperial Oil Enterprises, Ltd.
Inland Steel Company
Intalco Aluminum Corporation
Inter B.C. Gas Transmission Ltd.
Interprovincial Pipeline Company
Iron Ore Company of Canada Limited
Jones & Laughlin Steel Corporation
Kansas Power and Light Company
Kennecott Copper Corporation
Labrador Mining & Exploration, Limited
Lever Brothers Company
Lone Star Cement Corporation
Lucky Lager Brewing Co.
Marathon Oil Company
Maui Electric Company, Ltd.
Merck and Company
Metropolitan Water District of Southern California
Mississippi Power and Light Company
Mobil Oil Corporation
Molybdenum Corporation of America
Monsanto Company
Montana Power Company
Monterey Flood Control and Water Conservation District
National Aeronautics and Space Administration
National Distillers and Chemical Corporation
National Steel Corporation
New Brunswick Development Corporation
Newmont Mining Company
New York State Electric & Gas Corporation
Norris-Thermador Corporation
North American Aviation, Inc.
Northgate Exploration Limited
Northern Natural Gas Company
Nuclear Fuel Services, Inc.
Olin Mathieson Chemical Corporation
Orange and Rockland Utilities, Inc.
Otter Tail Power Company
Owens-Corning Fiberglas Corporation

Pacific Gas and Electric Company
Pacific Gas Transmission Company
Pacific Power & Light Company
Pacific Western Industries, Inc.
Page-Hersey Tubes Limited
Pennsylvania Electric Company
Petro-Tex Chemical Corporation
Philadelphia Electric Company
Pickands Mather & Company
Portland General Electric Company
Potomac Electric Power Company
Procter & Gamble Company
Puget Sound Power & Light Company
Reynolds Metals Company
Rio Algom Mines Limited
Rio Tinto Mining Company of Canada Limited
Riverside Cement Company
Sacramento Municipal Utility District
Salt River Power District
San Diego Gas & Electric Company
Savannah River Nuclear Study Group, Inc.
Shell Canada Limited
Shell Chemical Corporation
Shell Oil Company
Skelly Oil Company
Southern California Edison Company
Standard Oil Company of California
Standard Oil Company (Kentucky)
Steep Rock Iron Mines, Limited
Sun Oil Company
Tenneco, Inc.
Texaco, Inc.
Tidewater Oil Company
Trans-Canada Pipe Lines Limited
Transcontinental Gas Pipe Line Corporation
Trans Mountain Oil Pipe Line Company
Union Carbide Corporation
Union Carbide of Canada, Limited
Union Electric Company
Union Gas Company of Canada, Limited
Union Oil Company of California
U.S. Air Force
U.S. Army, Corps of Engineers
U.S. Atomic Energy Commission
U.S. Department of Commerce —
Maritime Administration
U.S. Navy
United States Steel Corporation
United Vintners, Inc.
University of Toronto
Utah Power & Light Company
Westcoast Transmission Company Limited
West Texas Utilities Company
Western Energy Supply & Transmission Associates
Westinghouse Electric Corp.
Wilshire Oil Company of California

In Other Countries

Ampol Refineries Limited
Anglo American International (U.K.) Limited
Arabian American Oil Company
Bataafse Internationale Petroleum Maatschappij N.V.
The British Petroleum Company Limited
C.A. Electricidad de Caracas
Comisión Federal de Electricidad de la Republica Mexicana
Compagnie Francaise de Raffinage
Compagnie de Raffinage Shell Berre
Compagnie des Transports par Pipe-Lines au Sahara
Continental Carbon Company
Conzinc Riotinto of Australia Limited
Deutsche Transalpine Oelleitung G.m.b.H.
Dow Chemical International A.G.
Esso Standard (Libya) Inc.
Fertilizantes Fosfatados Mexicanos S.A. de C.V.
Gulf Oil Refining Limited
Imperial Chemical Industries Limited
Indian Oil Corp. Ltd.
Intercontinental Hotels Corporation
International General Electric Company
Iran Pan American Oil Company
Irish Base Metals Limited
Kuwait Oil Company Limited
Laporte Industries Limited
Marathon Chemische Werke Bayern G.m.b.H.
Mobil Oil Libya Limited
Moonie Pipe Line Company, Pty., Ltd.
National Bulk Carriers, Inc.
Nederlandse Gasunie N.V.
Ministry of Works, Government of New Zealand
Mt. Newman Mining Company Pty. Ltd.
The New Zealand Refining Company Limited
N.V. Rotterdam-Rijn Pijpleiding Maatschappij
Oasis Oil Company of Libya, Inc.
Orinoco Mining Company
Palabora Mining Company Limited
Petroleos Mexicanos
Petroleum Refineries (Austrailia) Pty., Ltd.
Pickands Mather & Co. International
Regenet Refining Company, Ltd.
Rhein-Donau Oelleitung G.m.b.H.
Rhone-Alpes
The Rio Tinto Zinc Corporation Limited
Société du Pipe-Line Sud-Européen
Société Nationale de Transport
et de Commercialisation (Sonatrach)
Southern Peru Copper Corporation
S.A. Texaco Belgium N.V.
Texaco Trinidad, Inc.
Thyssensche Gas und Wasserwerke G.m.b.H.
Trans-Arabian Pipe Line Company

SHIPYARD AND MARINE PROJECTS

CLIENT	*DESCRIPTION*	*LOCATION*
American Export Isbrandtsen Co.	Port of New York Containership Terminal and Industrial Park Master Plan	New York
American Export Isbrandtsen Co.	Port of New York Supertanker Terminal	New York
Miami – Dade County	Industrial Seaport Master Plan	Florida
Board of Harbor Commissioners	Port of New Orleans Long Range Development Plan	Louisiana
Lockheed Shipbuilding Co.	FDL Automated Shipyard	Florida
Todd Shipyards Corporation	DX Automated Shipyard	California
Bath Iron Works	DX Automated Shipyard	Maine
Todd Shipyards Corporation	Shipyard Modifications	California
Maritime Administration Dept. of Commerce	Mobile Emergency Port Facilities	Worldwide
Mobile Chemical Company	North Sea Canal Petrochemical Center Master Plan	Netherlands
City of New York	Food Distribution Center and Ocean Terminal	New York
United States Lines	Consolidated Marine Passenger Terminal	New York
British American Oil Company	Deep Water Petrochemical Center Master Plan	Nova Scotia
Cook Inlet Pipeline Co.	Loading, Docking Facility	Alaska
Cargill Company	Grain Loading Terminal	Seattle
General Petroleum	Marine Terminal Evaluation	New York
U.S. Navy	Automated Shipyard Study	– –
Oasis Oil	Sea Berth, Submarine Line	Libya
Associated Octel	Bulk Storage Terminal	Sweden
Petroleum Refineries	Tankage Terminal, Desalter	Australia
Standard Oil	Pumping Stations Terminals	Columbia
Arabian American Oil	Marine Terminal	Saudi Arabia
Bahrain Petroleum Co.	Marine Terminal	Bahrain
Sentinel Mining	Marine Shiploading Facility	Australia
S.O.I.T.	Trans-Alpine Pipeline, Terminal	Italy
Occidental Petroleum Corporation	Terminal Complex	Libya
National Iranian Tanker Co.	Drydock Facilities Study	Iran

BECHTEL'S MARINE EXPERIENCE

TERMINALS CONSTRUCTED

CLIENT	LOCATION	NO. BERTHS	VESSEL (DWT) SIZE
U. S. Army	California	4	40,000
Texaco	Washington	2	85,000
Shell Oil Co.	Washington	2	40,000
General Petroleum Co.	Washington	2	40,000
American Sugar	Massachusetts	1	50,000
Reynolds Metals	Washington	1	30,000
Cook Inlet Pipeline Co.	Alaska	1	60,000
Tidewater Oil Co.	California	1	38,000
Pacific Gas & Electric	California	1	32,000
Trans Mountain	Canada	1	16,000
Orinoco Mining Co.	Venezuela	1	50,000
Refineria Panama	Panama	2	100,000
CIA. Petrolera Shell	Cuba	2	16,000
U. S. Navy	Philippines	20	40,000
Caltex Pacific	Sumatra	2	85,000
Kuwait Oil Co.	Kuwait	8	100,000
Kuwait Oil Co.	Kuwait	3	100,000
Arabian American Oil Co.	Saudi Arabia	4	30,000
Arabian American Oil Co.	Saudi Arabia	4	30,000
Kingdom of Saudi Arabia	Saudi Arabia	2	10,000
Kingdom of Saudi Arabia	Saudi Arabia	2	20,000
Bahrain Petroleum Co.	Bahrain	4	30,000
British Petroleum Co.	Aden	4	32,000
Trapsa	Tunisia	2	73,000
Regent Refining Co.	Wales, U.K.	5	100,000
Mobil Oil N.V.	Netherlands	1	200,000
Transalpine Pipeline Co.	Italy	3	160,000
Ampol Petroleum Co.	Australia	1	35,000
Esso Standard Oil Co.	Australia	1	5,000
Texaco	Louisiana	1	45,000
Texaco	California	3	105,000

SERVICES

PROFESSIONAL SERVICES

The following are some of the professional services frequently performed by Bechtel for various clients:

Feasibility Studies
Economic analyses, plan appraisals, sources of materials, marketing, distribution and transportation studies, site surveys, availability and cost of labor, supplies and utilities, and cost of investment analyses

Preliminary Engineering
Design criteria, master plans and schedules, process and materials handling studies, site and facility planning, schematic designs and specifications, and estimates of construction and operations costs

Process Engineering
Conversion of basic process data and design criteria into an integral processing plan specifying manufacturing or flow rates, volumes, temperatures, pressures, heat and materials balances, sizes and specifications for major equipment

Preliminary Design
Facility or plant layout, including general arrangement, orientation of facility physical elements, and basic design concepts

Preparation of Plans and Specifications
Final detailed engineering construction drawings and specifications, bills of materials, construction cost estimate, all as required to undertake procurement, fabrication, and construction

Engineering Supervision
Monitoring construction forces, including testing materials and construction, interpretation of designs and specifications and review of vendor prints

PROFESSIONAL GOALS

In our organization there is a close working relationship between the different disciplines. Most of the members of our staff have had construction experience including field supervision, giving them the practical approach necessary for economy. Our design and construction experience makes us particularly aware of the cost relationship of planning, design, and design details, as well as construction and equipment costs. Consequently, we have achieved a reputation for doing complex and difficult work well, on schedule, and within budget.

MASTER PLANNING SERVICES

A long and successful record of planning large industrial and military facilities all over the world has proved Bechtel's capability in formulating master plans. Bechtel planning includes assistance to clients in evaluation of the present and anticipated economic and social climate vision balanced against experience in planning the task's broadest scope and finest detail. Bechtel retains permanently associated consultants, experts in all phases of the company's activities. As master plans are developed, including time schedules, general specifications, and cost estimates, the client's needs — present and future — are anticipated. Our approach to preparing a master plan is:

- Collect and analyze background data
- Prepare criteria for development of an entire program
- Formulate the plan and its elements, including a function analysis, site plan, incremental development, water and waste systems, mechanical systems, electrical systems, communi-

cation systems, process systems, site security, and traffic organization

- Develop vocabulary for site, buildings, processes and other requirements to define a program concept which will be flexible, attractive, functionally integrated, and have consistency of design, materials, and systems

ARCHITECTURAL SERVICES

Architects of Bechtel Corporation are registered in many states and are members of the American Institute of Architects, corporate rank. They have broad experience in the general field of architecture, and their training has been obtained in some of the finest schools of architecture in the world. Their work includes the design of numerous military and defense facilities, as well as industrial projects.

Our architects have had foreign work experience on military installations involving preliminary reconnaissance work in jungle areas, establishing requirements for docking facilities, land use studies, design of storage and refrigeration facilities, administration and housing, together with all utilities.

These architects have worked with civil, structural, mechanical, and electrical engineers on project teams in the preparation of working drawings and specifications. Most of our architectural staff have had construction experience, including field supervision.

SYSTEMS ENGINEERING

Our systems engineering staff scientifically analyzes a client's project requirements and objectives and systematically develops the optimum systems design requirements for all program phases of the total system. The final product includes all documentation required for the project – specifications for system design and development, system tests, checkout procedures, operating procedures, equipment, facilities, personnel training, and procedural data.

Bechtel's systems engineering group is directed by our chief nuclear engineer and is staffed by specialists in diversified technical disciplines, including:

- Systems engineers
- Systems effectiveness engineers and analysts
- Computer specialists
- Mathematicians
- Economists
- Sociologists
- Political scientists
- Geologists

Thus, we have an excellent entry into such factors as performance, reliability, availability, maintainability, safety, value engineering, quality assurance, and logistics support.

Our basic objective is to identify and document the technical requirements of each system and its components. Special attention is given to the application of cost-benefit optimization trade-off analyses and definitions that can materially improve system performance, operating and schedule times, and costs.

Systems engineering is basically an iterative process. The first iteration starts with an analysis of a system's prime function and objective requirements; it then:

- Determines interrelated sub-function requirements
- Develops the sub-function requirements
- Indicates time and design critical functions
- Defines design requirements
- Determines trade-off cost benefits

Our extensive experience in planning, engineering, and constructing many complex industrial and military projects during the last quarter century reflects the know-how required to blend system engineering theory and practical experience into a working conceptual design and operational end product.

STRUCTURAL AND CIVIL ENGINEERING SERVICES

Our structural and civil engineers are technically competent specialists with experience in site work, utility and fire protection systems, as well as indeterminate structure analysis, prestressed concrete design, ultimate strength method design, dynamic response calculations, earthquake effects, soil mechanics, hydraulics, hydrology, earthwork dams, tunneling, roads, and bridges. Our engineers have completed many designs, making use of virtually all construction materials. They are especially qualified in the structural use of reinforced concrete, structural steel, stone, brick, block, wood, and corrosion-resistant metals.

MECHANICAL ENGINEERING SERVICES

Bechtel's mechanical engineers have extensive experience in the analysis of system dynamics, stresses and vibrations, heat and material balance calculations, fluid mechanics, mechanical equipment design and application, process and cryogenic piping, instrumentation and automation, special air conditioning applications, welding procedures, and other specialized work. Many engineers have joined Bechtel after being established for years in the design, application, and testing of mechanical equipment such as boilers, turbines, heat exchangers, pumps, instruments and controls. These specialized backgrounds, together with experience gained on widely diversified Bechtel projects, have given them the broad understanding necessary to solve new and unusual engineering problems.

Bechtel engineers have designed numerous mechanical and control devices in the course of engineering a variety of facilities. Extremely heavy, special vessels for thermal, nuclear, and chemical processes have been designed. Special pumps, valves, and fittings have been developed to satisfy the requirements of unusual processes. Unique hydraulic, pneumatic, and electrical control schemes and components have been devised for the operation and regulation of large equipment operating under extreme pressure, temperature, and radiation conditions. Automation has been applied to a large, central, steam-electric generating station, so that for the first time a turbine-generator unit can be started, operated, and stopped by a simple push-button command. Our air conditioning staff has engineered systems to govern the heating, cooling, and ventilating of spaces exposed to radioactive contamination. Other projects have required ultimate dust control, removal of radioactive particles, and accurate humidity controls.

ELECTRICAL ENGINEERING SERVICES

The Bechtel electrical engineering staff comprises engineers with broad electrical experience and specialists in power, distribution systems, controls, instrumentation, lighting, and communications.

They have engineered all electrical phases of huge power projects from original concept through startup and initial operation. The power work covers system load and stability studies, selection and sizing of equipment for power supply substations and generating stations, underground and overhead distribution systems, and emergency power supplies. Power generating facilities, substations, and distribution systems have been engineered for electrical utilities, industrial plants, refineries, chemical plants, pipelines, commercial buildings, and missile launching facilities.

The power plants our people have designed have been largely automatic and semi-automatic, requiring the design of complicated control circuits and the application of modern indicating, recording, control, and protective devices. Unattended hydro stations, substations, and pumping stations have required supervisory control and telemetered instrumentation with carrier current and microwave facilities. Safe, automatic controls and instrumentation have also been designed for refineries, process plants, and missile launching facilities. Fire detection monitoring and alarm systems have been designed for numerous facilities.

Lighting has been designed for all types of locations, indoor and outdoor. This includes lighting for offices, production and process areas, flood, periphery, and security lighting.

We have designed and installed intercommunications, paging, and PAX telephone systems on numerous projects.

TRAFFIC ENGINEERING SERVICES

Bechtel has experienced traffic engineers on its staff who participate in the planning of new facilities to enable the expeditious movement of traffic to and within the new development while minimizing the penalty to existing traffic patterns in the area.

ENGINEER–MANAGER SERVICES

As engineer-manager, Bechtel performs all planning and administrative functions; prepares designs, specifications, and contracts; purchases, inspects, expedites materials and equipment, evaluates bids, awards contracts in the name of the Owner, and supervises the work. The Owner retains complete control and is free to participate in the work to the extent he chooses. This arrangement assures a fast schedule, competitive or lump sum pricing for major equipment and construction contracts, plus the insurance of having Bechtel prepared to take over construction if the selected contractor fails to perform.

Acting as engineer-manager, Bechtel assigns a trained staff under a seasoned manager to carry the work through from concept to completion. This staff is flexible. The manager may call upon a staff of over 4500 engineers and technical personnel for specialized services as required. The arrangement offers certain obvious advantages to the Owner:

- The owner retains complete control
- Single source availability of a wide variety of skilled specialists is provided on an as-required basis so that the Owner is freed from the necessity of assembling a specialized staff and later disposing of it or absorbing it into his operating organization
- The owner is assured that work will proceed rapidly and economically, because the centering of responsibility for all functions in a single, capable organization eliminates duplication and confusion and minimizes technical and organization interfaces

CONSTRUCTION SERVICES

Bechtel has a fully staffed construction organization, experienced in operations in all parts of the world. Within the United States, Bechtel performs most of the construction work with its own staff except for certain kinds of works requiring specialists. Local labor is employed wherever possible, and in foreign countries Bechtel frequently conducts training courses to insure that local trades will be competent.

SUBCONTRACTING SERVICES

Because of its extensive scope of construction activities, Bechtel is in a position to do — and in usual cases does — most of the work that other general contractors subcontract. Our construction organization is currently performing on various jobs the work of practically every trade or craft.

However, Bechtel has broad experience in the negotiation and administration of subcontracts. With a varied knowledge gained from doing many different projects, we are able to administer subcontract work advantageously to secure the best quality and most efficient job for the client when the client desires or other conditions indicate the advisability of subcontracting parts of the work.

SUPPORTING SERVICES

Our engineering and construction organizations are backed by strong and energetic management and service groups in the home office. Senior members of these management groups are professional engineers with long experience in design, construction, and supporting operations.

Estimating

Because Bechtel constructs most of the plans it designs, a wide variety of actual cost budgeting and control information is available for engineering and management use. Bechtel's Cost Estimating Department is thereby completely informed on all important cost trends. Its staff of highly trained engineers, employing the latest techniques of computer storage, comparison, and printout of information, is able to predict probable cost figures for specified conditions. This effort, combining the experience and judgment of qualified engineers with the rapidity and accuracy of mechanized data retrieval, contributes materially to the validity of cost estimates and of lowest cost commensurate with high quality.

As part of its responsibilities, the Cost Estimating Department also follows cost developments and job progress for the project. Regular job progress reports and forecasts of final cost are issued periodically to keep Bechtel administration and client management completely informed on fiscal requirements and project status. This activity not only provides excellent current project control data, but furnishes valuable reference material that is employed in estimating the cost of a project.

Procurement

The design and construction organizations are supported by the purchasing group of Bechtel Corporation. Procurement activities are carried out through the design operation and into the field in the degree required for each operation. Bechtel maintains purchasing, expediting, and inspection staffs in major cities throughout the world, and this capability is directed as necessary to smooth out the flow of materials and equipment from the suppliers' shops to the jobsite.

It is Bechtel's responsibility to ensure that all materials purchased for Bechtel conform to the pre-established criteria relative to cleanliness, quality of manufacture, workmanship, and the like before shipping to the site, and that all material meets the specifications. In addition, it is Bechtel's responsibility to assure proper handling and processing of the purchased material during packaging for shipment and delivery.

Labor Relations

Good labor climate is influenced by the labor relations record of the constructor. Bechtel has developed sound and effective techniques and procedures for the highest degree of labor productivity and continuity of the work. Pre-job conferences with union representatives such as have been con-

ducted successfully on all major projects are utilized. Schedules, project description, labor practices, selection of foremen, and all details pertinent to job completion are anticipated and discussed.

Bechtel has national agreements with all major AFL–CIO building trade unions. In many cases, these major agreements, negotiated at the national level under the direction of Mr. John O'Connell, contain favorable clauses, which supersede local regulations, promote increased efficiency, and reduce work stoppages.

Administration

Bechtel maintains a specialized administrative staff to handle payrolls, taxes, accounting, and budgetary controls. Under the supervision of an Administrative Manager, Bechtel assigns experienced field administrators to the jobsite to handle such important functions as local payroll, invoice checking and payment, and cost accounting. The jobsite representatives are thus able to monitor closely in the field the day-to-day occurrences that have a direct bearing on final costs. Consequently, budgetary controls and cost accounting data are closely related to the project, providing continuous, effective cost control.

COST CONTROL AND PROJECT SCHEDULING SERVICES

Bechtel project management is experienced in meeting close cost budgets in both engineering and construction activities. Control of costs is one of the project management's primary concerns, and budgetary controls and cost accounting data are used continuously to effect satisfactory cost and expense control. On large work the project superintendent has a cost engineer for constant cost analysis work.

Bechtel has the capability to apply critical path method (CPM) techniques to engineering and construction projects. CPM offers a systematic approach to engineering and construction where project planning, scheduling, and control of labor, equipment, and materials must be coordinated. We have applied CPM to the RIFT program for NASA, MMRBM facilities for the Air Force, Chocolate Bayou project for Monsanto and many other aerospace and industrial projects.

COMPUTER SERVICES

Bechtel Corporation has recognized the importance of electronic computers as tools in engineering and design. Our experience in the application of computers in solving problems dates back to 1955. Since that time we have developed a large computer program library utilizing the most advanced computers available.

Bechtel's Vernon Division, by use of a data link, has direct and immediate use of the company's large-scale general purpose GE 625 and the IBM 360 computers. The speed and efficiency which results from such a setup is apparent.

Bechtel's personnel have written the programs used in solving the engineering, construction, or planning programs. This provides a much greater understanding of the problems, with far greater efficiency than if Bechtel had to contract with an outside computer service. A company-wide Computer Services Group has been established for program development and coordination under the direction of a corporate computer committee. A majority of our engineers are trained in the use of computers and programming.